SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LV.—No. 25. [NEW SERIES.] NEW YORK, DECEMBER 18, 1886. [Price 10 Cents. $3.00 per Year.

THE FIRST TYPE WRITING MACHINE.

Although the production of type writing machines, as an industry, at the present time has reached large proportions and obtained permanent footing among the great manufacturers of the day, still it may be said only to be in its infancy. The utility of the type writer is so great, its success so marked, its applications so numerous, that no prophetic vision is required to perceive that, ere long, it will become spread throughout the civilized world, like the clock and the sewing machine. The type writer supplies a great public want; it facilitates the transaction of mercantile and professional labors, and opens new fields for popular employment. As an occupation for intelligent women, type writing and stenography appear to be admirably adapted, and thousands of ladies now practice these arts with success.

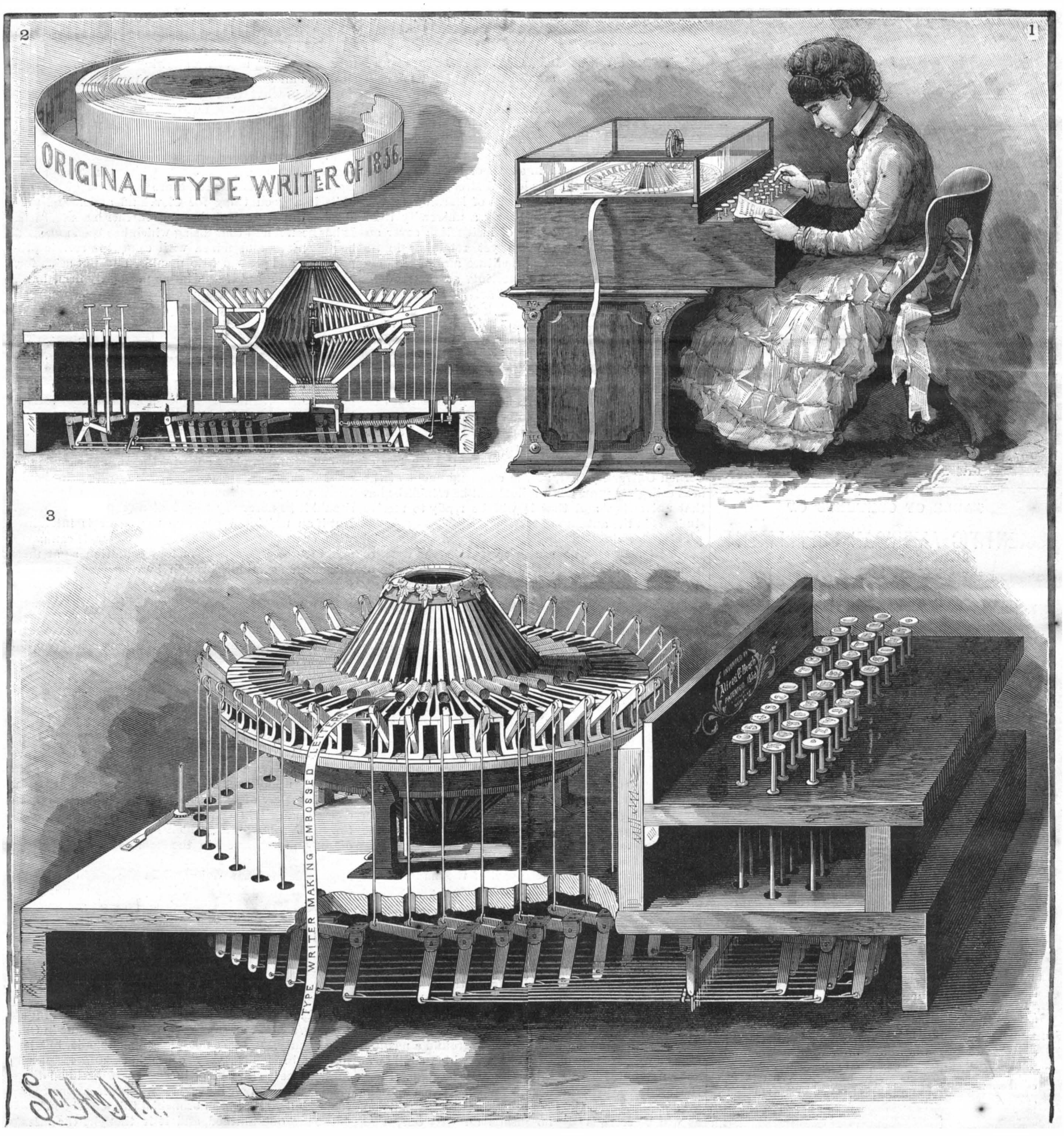
We have thought our readers might be interested in the early history of the type writer, and in the original machine that opened the way and was, in fact, the pattern upon which the most successful mechanisms of this class were based. The type writer was the invention of Mr. Alfred E. Beach, of New York, one of the editors and proprietors of the SCIENTIFIC AMERICAN.

We present herewith engravings taken from the original machine, which was constructed in 1856, and still exists, in perfect order. It is an elegant specimen of mechanical skill.

All who are acquainted with the modern typewriters will at once recognize in this machine, as here delineated, the underlying principle upon which they work, namely, the basket of type levers arranged on a circle, so as to strike or deliver their impressions on a common center, forming printed lines. The moment this system or principle was embodied in a working machine, the modern type writer became possible.

From that time onward the talents of good inventors were employed in perfecting details of construction and adding new improvements, until now the market is supplied with the most splendid machines, such as the Remington, by which printing from written copy

(*Continued on page* 389.)



THE ORIGINAL TYPE WRITING MACHINE, FOR WHICH THE GOLD MEDAL OF THE AMERICAN INSTITUTE WAS AWARDED IN 1856.

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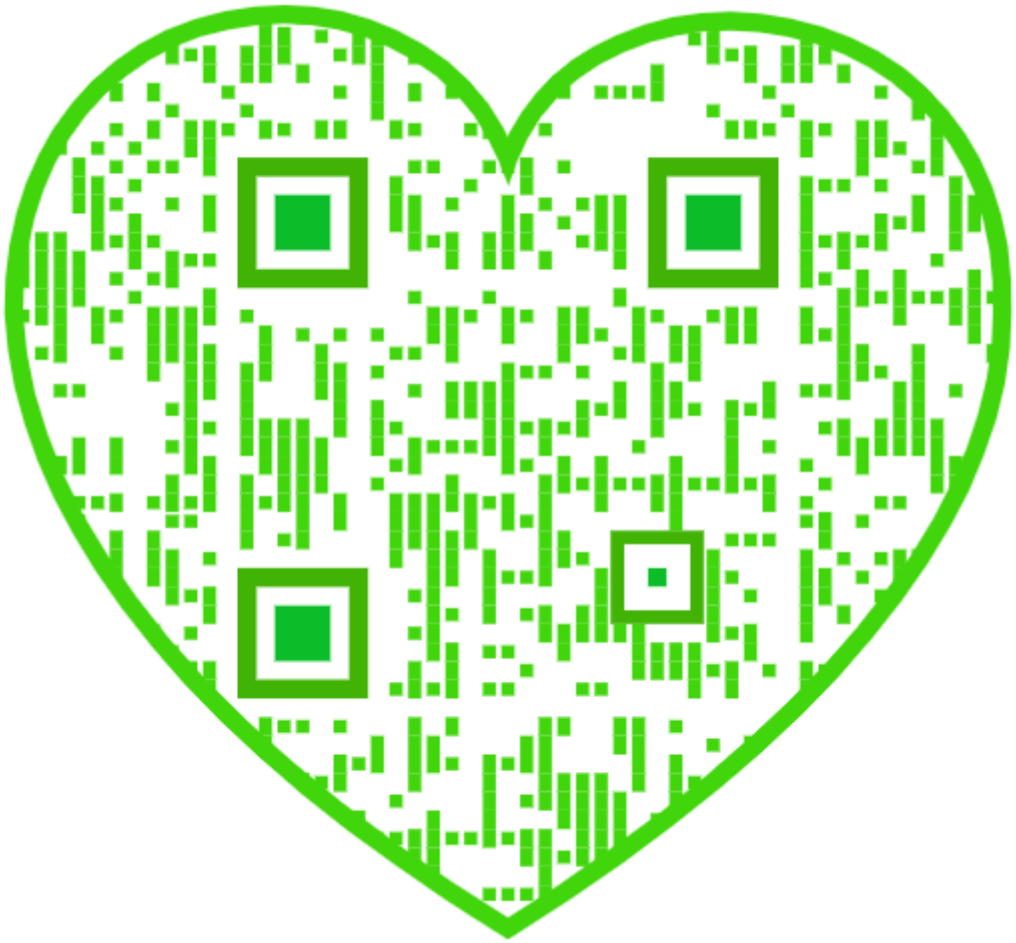

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

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NEW YORK, SATURDAY, DECEMBER 18, 1886.

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THE PRESIDENT'S MESSAGE AND THE PATENT OFFICE.

In a short clause of his annual message, presented to Congress on December 6, President Cleveland commends the bringing forward of the business of the Patent Office, and promises still more for the future. On the 4th of March, 1885, he states the current business was in arrears on an average five and one-half months. Several divisions were twelve months behind. Three months is given as the average of the arrears at the close of the last fiscal year, and the prediction is made, substantially, that soon only a nominal delay will precede the examination of each case. This will be most cheering news to the inventor, who hitherto has been disheartened in his work by the endless delays in obtaining protection for his invention.

The Treasury Department receives this year a surplus of $163,710.30 from the Patent Office, the receipts of the office aggregating $1,205,167.80. The large volume of its business appears from the number of patents granted—25,619. Notwithstanding its growing business, no increase of force is asked for, the Commissioner apparently feeling able to cope with the work with the present number of employes. The tendency to reduction of expense is shown in the estimates for three successive years. For the year ending June 30, 1886, $890,760 was estimated; for the year ending June 30, 1887, $853,960; and for the year ending June 30, 1888, the estimate is only $778,770.

PROGRESS OF CORNELL UNIVERSITY.

Under the careful management of Mr. Cornell and of his successors in the administration of the finances of the institution—the board of trustees—and under the guiding hands of Andrew D. White and of Charles Kendall Adams, the past and present presidents of the University, the institution has become at once the largest and the most successful—both in the sense of growth in numbers, and in extent of its range of instruction, and the magnitude and strength of its faculty—of the great establishments of learning in the United States, and is more nearly a university than almost any other. Its courses of instruction cover an exceedingly wide range, while yet retaining in its scheme the department of agriculture and of the mechanic arts—mechanical engineering, as the modern name goes—and "related studies" as its leading courses. The classics are taught at Cornell by some of the ablest teachers in the country, and in history and political economy a corps of professors of unusual strength give such instruction as only a great university can offer. Liberal education stands at Cornell where its friends would desire that it should stand in every great college, and all students who have the means and desire to do so, even when proposing to enter the technical courses, may obtain a good, broad, and liberal general education before attempting professional work.

The announcement is now made by the trustees of Cornell University that, at the commencement of the next collegiate year, a law school will be established at that university, and that it will be ready to receive students in the autumn of 1887.

This determination will be looked upon with special satisfaction by all who are interested in the work of promotion of the useful arts, not only from the side of the schools, but also practically; as it will undoubtedly enable all so desiring to secure the best possible instruction in the laws having special importance to those engaged in such vocations as have closest relations with the arts on the one side and the law on the other.

In addition to the law school, we are soon to have the present courses broadened into a special school of mechanical engineering, as well as of the civil engineering, of railways, followed, in due time, by a school of steam engineering, schools of the engineering of the textile manufactures, and other branches of mechanical engineering; and, finally, when these schools of mechanical engineering are provided for properly, it is expected that a school of mining engineering of exceptional completeness in its corps of instructors and in its outfit may be founded as an important part of the Sibley College system.

Evidence of progress like this at Cornell is indicative of ability and purpose on the part of the management to keep up with the spirit of the times, and will be highly gratifying to all who are interested in the advancement of practical education.

WILL THE BROOKLYN WIRES BE BURIED?

The Brooklyn Board of Commissioners of Electrical Subways has received advice from the Corporation Counsel, in which he tells them that the electrical companies must be provided with a subway in which their service may be carried on unimpaired. In other words, they are required to furnish underground a medium for the operation of electrical wires which shall be as good as that furnished by the pole system. Since the air is the best insulation for such wires and the ground the worst, the task set before the Commission, as will be seen, is by no means an easy one, and, perhaps, its fulfillment is not even possible.

There is no known means at present of making wires work as well for considerable distances under as above ground.

As showing the little progress that has been made of late in lessening induction and retardation, the enemies of good telephone and telegraph service, we have the evidence presented to the recent electric light and telephone conventions. This shows that though skillful electricians have worked assiduously at the problem, little or no progress has been made in a twelvemonth; that the mal-influences which disturb underground telegraph wires, and telephone wires above and especially under the ground, remain unchecked and unexplained.

Fortunately for the Brooklyn Subway Commission, the Corporation Counsel does not insist that they shall find a means of burying the wires as efficient as that now in operation through the air, but only that such a subway shall be found before the electrical companies are *forced* to bury their wires. There is an alternative, fortunately, for the Commission, a door of escape out of this perplexing dilemma.

Slag Pavements.

A new industry has been started in Middlesbrough, Eng., the object of which is to utilize blast furnace slag in a somewhat more definite and systematic manner than has hitherto been attempted. The works where it is carried on belong to a limited company, the managing director of which is Mr. J. A. Jones. One of the objects of the company is to make paving sets. These are produced by pouring blast furnace slag into metallic moulds, and then allowing the castings to cool slowly in an annealing furnace. Without annealing, slag cast in whatever form is certain to fly to pieces by the unequal contraction which takes place as it cools. With annealing it can be cast into almost any form, and when finished is as hard and tough as a basaltic rock. Inasmuch as these sets are as serviceable as those which are hewn from whinstone, and much more shapely, the manufacture and sale of them is of itself a good thing for Cleveland and for all purchasing districts. But there are further manufactures. It has been found that if slag which has been annealed be pulverized, and mixed with cement in certain proportions, and pressed into moulds, and put aside for, say, three months, it sets into a peculiarly firm, hard, and solid mass. The value of these qualities was soon perceived, especially as applied to the manufacture of concrete flagstones. Consequently, the company referred to is making these and laying them down for footpaths, railway station platforms, and so forth. The standard size of flagstone is about 3 ft. by 2 ft. by 3 in. They are exceedingly flat and smooth, and usually hard on the surface. When laid down in place, they form a beautiful, even surface, far superior to what is ever obtained with the best Caithness flags. Town surveyors always prefer pavements laid with flags to those made by concreting in place; for in the former case one or more flags can be taken up and laid down again should there be any settlement of the foundation below, or should it be necessary to get at any pipes or drains. But if an unjointed concrete pavement is interfered with, or any settlement takes place below, it can never again be put into as satisfactory condition as at first. Inasmuch as Middlesbrough is a seaport town, and flagstones and paving sets are articles required everywhere, it is to be hoped that they will henceforth be exported coastwise and abroad. In this way something tangible might be done at once to find employment for the idle to tide over the long-continued depression of trade, and at the same time to prevent a further accumulation of slag in the vicinity.

Rewards of Successful Invention.

Mr. Leedham Binns, of the Binns Patent Band Company, of Philadelphia, has obtained several patents which have proved very valuable. In the manufacture of gold, silver, and copper tinsel yarns, for use in domestic upholstery goods, what is almost entirely a new industry, of considerable importance, has been created, largely in consequence of the patented inventions of Mr. Binns, for which he is said to have been directly remunerated in the sum of $375,000. These brilliant yarns are soft, and designed to be specially applicable in fine weaving, while the patented inventions referred to have made it possible to manufacture them so cheaply that they are becoming very popular. The company has been obliged recently to greatly enlarge its works, and the new uses to which such yarns are found suitable promise a continuous growth in the business.

A Remarkable Cattle Disease.

Dr. E. Salmon, Chief of the Bureau of Animal Industry at Washington, says that the cattle plague in Clinton County, Ind., is not pleuro-pneumonia, but bermicular bronchitis, very contagious, and frequently fatal. The post-mortem in each case disclosed thousands of small, hair-like, white worms, from one to two inches in length, in the bronchial tubes. The infected cattle are quarantined, and it is thought the disease will be checked.

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PHOTOGRAPHIC NOTES.

Mounting Large Photographs.—The following is recommended by Mr. Davanne as a method he observed in France for mounting large photographs, which we find reported in the *British Journal of Photography:*

All amateurs, as well as the trade, know how difficult it is to paste a photographic proof upon a large cardboard (bristol), so that in the shrinking or contraction of the proof no wrinkle or ridge should be apparent, but the whole lie perfectly flat.

The photographer in question had a large flat box of the size of the cardboard, on the bottom of which the cardboard is laid. A kind of frame on hinges, joined to the box in the form of a lid, is now closed and fastened down to the box by means of hooks. This frame or lid has an opening in the center a quarter of an inch each way larger than the proof or print to be pasted. The box is only about one inch high, and on the bottom is placed a piece of wood about half an inch thick, beveled off toward the four sides, and of the exact size of the print to be pasted. In the center of the bottom of the box is fastened a strong screw, so as to raise or fall the piece of beveled wood. Its use can now easily be guessed. The bristol is placed in the box, the lid of which is closed, the screw is turned, the center of the bristol is pressed up the hole in the lid. The pasted proof is taken and placed on the bristol, the square hole serving at the same time as a guide. The quarter of an inch given to the opening on each side allows the proof to be taken by the fingers and placed in its proper place with the greatest ease. It appears that this bulging out of the middle of the cardboard before pasting on the proof gives perfect flatness to the whole when dry.

One of the members, at the instigation of M. Davanne, had one of these boxes made, and he assured the members that he was very much pleased, and could recommend its use.

Another member informed us that he had always succeeded without any apparatus whatever to get his proofs flat, "or flat enough for every purpose," simply by cutting out a thick piece of blotting paper of the exact size of the print to be pasted, and, after having dampened it, he laid it upon the back of the cardboard for about fifteen minutes before pasting it on the print. In fact, the two methods have for object to raise the center of the cardboard, so that when the print dries and contracts the cardboard becomes flat. Both these dodges are good, but the latter has in its favor its simplicity.

Gas Engines for Large Powers.

The works at Deutz, where Otto's gas engines are being built, are now busy with large motors of this class for driving mills and factories, instead of the usual steam engine. These gas engines are used in connection with a special gas-making plant, and it is stated that whereas the average consumption of an ordinary steam engine is 3¼ lb. of coal per horse power, the corresponding consumption of the gas engine is only 2¼ lb., and this economy has induced several works to replace their steam engines by large gas engines. Among these works are the zinc rolling mill of W. Grillo, in Oberhausen, where ten gas motors supply an aggregate of 244 H. P; the Mechern Berg Werk Verein, where seven motors supply an aggregate of 174 H. P.; the Russian company for the manufacture of powder in Schlusseburg, where seventeen motors supply an aggregate of 194 H. P.; a sugar factory in Elsdorf, where six motors supply an aggregate of 191 H. P.; the waterworks of the town of Coblenz, with 120 H. P.; the municipality of Prague, with 150 H. P. (for electric lighting); and the opera in Frankfort-on-the-Main, with two motors, having 100 H. P.

Meteor Showers.

Prof. Richard A. Proctor maintains that most of the meteor streams with which the earth comes in contact are derived from the earth itself; that is, thrown off by volcanic action at a time when the internal forces of our planet were sufficiently active to give the initial velocity, some twelve miles a second, requisite to carry them beyond the earth's attraction. Comets, which he regards as the parents of the meteor streams, he thinks may have originated outside our solar system. Most of the comets whose orbits belong to our system, he thinks originated in the larger planets. The sun is now, perhaps, giving birth frequently to comets which probably pass beyond the limits of its attraction.

Varnish for Metals.

A so-called vulcanized varnish is recommended by the *Zeitschrift fur Maschinenbau und Schlosserei.* This is ordinary linseed oil varnish, containing 5 to 10 per cent of sulphur. A solution of flowers of sulphur in hot turpentine oil is prepared, to which a corresponding quantity of linseed oil varnish is added, and the whole well stirred. This mixture preserves metals against oxidation by transforming their surfaces into sulphuric combinations. By mixing vulcanized varnish with non-metallic coloring substances, or with a solution of asphalt, excellent weather proof paint is obtained for application in any color to metallic surfaces.

The Electric Light and Fire Losses.*

The importance of the electric light as a factor in the advancement of human progress has been fully demonstrated, but it has brought with it an element of danger by destruction of property that must be examined into, and, if possible, eliminated.

There is no denying the fact that the electric light is destined, in the near future, to largely supplant all other methods of illumination at present in vogue. All other forces now employed, such as illuminating gas, coal oils, and fluids of like nature, are under certain restrictions of law, both as to their manufacture and use. Gas companies are compelled to furnish a gas not below a certain degree of luminosity, and not to contain more than a certain percentage of impurities. Coal oil is likewise restricted to a minimum degree of fire test, below which its use is prohibited. The same is true of naphtha and burning fluids, which are not to be stored in quantities, except under certain restrictions. All of these safeguards are intended to lessen the danger to the community from their use, and thus decrease the danger from conflagrations that would otherwise arise. Nevertheless, in spite of all these precautions, fires continue to occur, and in many cases from direct infractions of these laws.

The principle of electric lighting may be said to be a comparatively new discovery. Intensity of light means intensity of heat, and heat results in fire unless carefully guarded against. So far, while its danger to the unsophisticated is fully admitted, no laws, save in a few local instances, have been enacted for its use. The system is yet in its infancy, and while its powers and dangers are freely acknowledged, there are but few that have the technical knowledge sufficient to understand what is or is not safe in regard to its employment. Everything has to be left to the companies themselves; and while the latter have a vital interest in assuring the public that this great force can be made a tractable slave to man's use, it is obvious that the demands of the public call for skilled workmen in this direction faster than they can be furnished. For this reason much of the work must be deputed to men only partly familiar with the nature of the force employed. Under these conditions it will naturally follow that many mistakes will be made in running wires for this purpose in buildings now in course of erection, or in other buildings altered for this purpose.

The law of electric currents is that they will complete their circuit by the shortest possible route that lies open to them. The danger lies in their possible diversion from their proper intent through accident or carelessness. In doing this, there is a consequent danger of fire, if anything of a combustible nature lies in the short circuit made.

The only safeguard at present employed is the insulation of the wires by some good non-conducting substance, but so far there has been nothing of the kind that is not open to some objection. The overcharging of the wire from too powerful a current will generate a heat that will cause it to become red hot, and in this condition the covering will burn off, leaving the wire exposed to convey its heat to surrounding objects. Even in the absence of this cause, the wires may be left exposed in such a manner that the coverings may become rubbed off by the contact of surrounding objects. So that in either case the insulation is destroyed and the current set free to make mischief.

While admitting the dangers as at present existing, it is not denied that they can be overcome or controlled. The question is, to how great an extent do these dangers exist, and on whom should fall the task of guarding against them? The losses by fire resulting from the careless employment of this force will affect the public in general who are uninsured. It would seem, then, that the cities in which this light is used should appoint suitable men to see that all proper precautions are taken on the side of safety. At the same time, inasmuch as the insurance companies are inaugurating a more thorough system in regard to the inspection of risks, it would cost them but a trifle additional to secure competent men for this branch of the subject.

Undoubtedly, as time progresses, the public at large will become better acquainted with the nature of this force, and be able to use ordinary discrimination in its employment; but that time is still a long way off, and in the interim other precautions are necessary. It will be remembered that the introduction of coal oil or kerosene was followed by numerous explosions and fires, though at the present day its use is regarded as comparatively safe. The same result will follow in the case of the electric light when it becomes more common, and no doubt some method will be devised by which it may be handled more safely.

Apart from the danger existing as a direct means of causing fires, there is another nearly as great, from the present plan of stretching the wires on poles in the public streets. There are many cases where the wires thus exposed are a menace and obstacle to the firemen in the performance of their duties. The ordinary telegraph wire can be cut or handled with impunity; but the electric wire, heavily charged, as it must be, means a physical danger, and perhaps death, to the man who attempts to carelessly handle it. Cases of this kind are numerous, so much so that the suggestion has been made that firemen be provided with a pair of cutting nippers having glass or other insulated handles for the purpose of cutting these wires when it may become necessary without risk to the individual. Even this would not always be safe unless the precaution was observed of keeping the handles perfectly dry when using, as water is an excellent conductor.

While the benefit of this new force is acknowledged, public property should not be carelessly exposed to danger pending the time when a safer method of governing this force shall become known, and when experimental theories shall give place to practical success. In the mean time it behooves the fire underwriters to be on their guard against a force which threatens to materially add to the losses, and which losses show a tendency to increase rather than to decrease.

* *Insurance World.*

DECISIONS RELATING TO PATENTS.

U. S. Circuit Court.—District of Connecticut.

ENTERPRISE MANUFACTURING COMPANY, PENNSYLVANIA, *v.* SARGENT *et al.*

PATENT MINCE MEAT MACHINE.

Shipman, J.

A new combination of old parts for attaining an object may sometimes, and perhaps often, be so obvious as to merit no title to invention.

While in ordinary cases of new combinations of old parts for attaining an object novelty and utility are evidence of invention, there should be other evidence to show that it exists.

Evidence of invention, in addition to novelty and utility, may often be found in the machine itself, which shows that it came from a creative mind, or the necessary evidence may sometimes be found in the history of the invention.

In this case the patentee accomplished a new and beneficial result by means which others had been near to and apparently wanted to find, but did not see. *Held* that he was entitled to be styled an inventor.

The first and second claims of letters patent No. 271,398, of January 30, 1883, to John G. Baker, for a machine for mincing meat, considered, and *held* not infringed by the defendant's machine, patented in reissued letters patent No. 10,717, of April 17, 1886, to John H. Shaw.

U. S. Circuit Court.—Southern District of New York.

COLGATE *v.* THE WESTERN ELECTRIC MANUFACTURING COMPANY.

Wallace, J.

Infringement consisted in the sale of the patented article. Proof of an established license fee for the use of the invention *held* insufficient to authorize a recovery.

Royalty paid for a license to sell and transfer to purchasers the right to use is not the criterion of the value of an ordinary selling right.

U. S. Circuit Court.—Eastern District of Louisiana.

GAIL *et al. v.* WACKERBARTH *et al.*

TRADE MARK.

Pardee, J.

Parties will be restrained by injunction from putting up goods in packages in imitation of others in the trade calculated to deceive the buying public and to defraud the original users of such packages, but such imitation must be sufficiently close to have that effect or the injunction will be refused.

Spontaneous Combustion of Wood.

Mr. Braidwood, superintendent of the London fire engine establishment, stated before a committee of the House of Lords that by long exposure to heat not much exceeding that of boiling water, timber is brought into such a condition that something like spontaneous combustion takes place, and that it may take eight years for the heat from pipes charged with or used to convey steam, hot water, or heated air, laid among the joists of a floor, or in the heart of a partition, or elsewhere in a building, incased in timber, to induce the condition necessary to the actual ignition of the timber.

Fluorescence of Bismuth.

Sulphate of bismuth, according to M. De Boisbaudran, does not fluoresce in a vacuum when submitted to the action of the electric discharge; but when mixed with sulphate of calcium, it gives out a fine reddish orange fluorescence. Sulphate of bismuth with sulphate of strontium gives a bright orange fluorescence; and with carbonate of strontium a blue light. With sulphate of magnesia, sulphate of bismuth gives an orange fluorescence. M. De Boisbaudran has applied this method to the discovery of traces of bismuth in a number of chemical products and reagents of the laboratory, several of which were reported to be pure.

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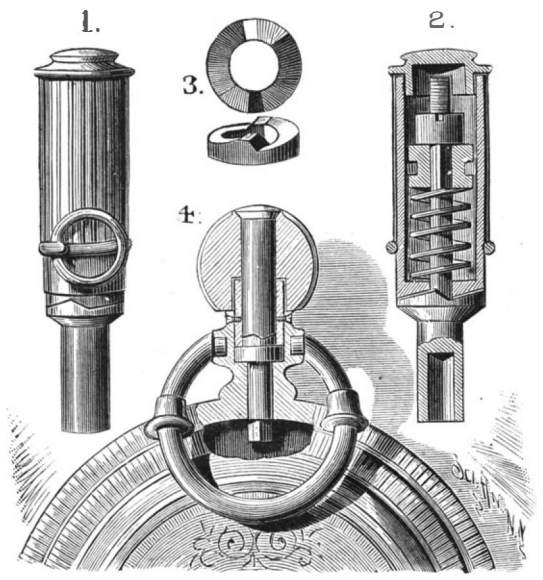
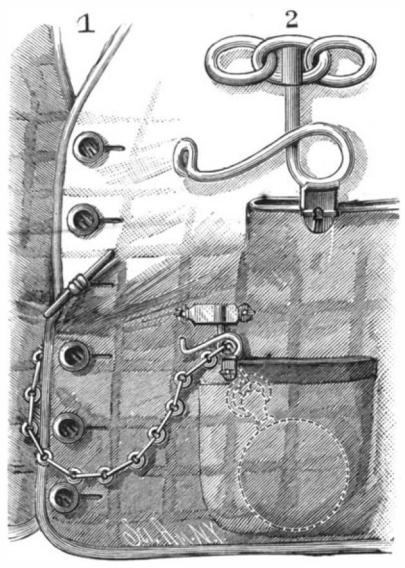
WATCH PENDANT KEY AND SAFETY ATTACHMENT FOR WATCHES.

The inventions herewith illustrated have been patented by Mr. Daniel Nettekoven, of Fort Shaw, Montana. The upper engraving represents the watch pendant key, while the second shows the safety attachment. The key is formed with a shank having a square aperture, in which fits the pin attached to the pinion connected with the movement in the usual manner. The shank is provided with a ratchet wheel, shown detached in Fig. 3, which meshes with a corresponding wheel formed on the bottom of a hollow stem formed with plain or fluted sides or with a spherical fluted knob. The two ratchet wheels form the clutch of the winding mechanism. Fitting over the end of the hollow stem is a cap which prevents the entrance of dust. A spring, the arrangement of which is clearly shown in Fig. 2, holds the ratchet wheels in contact with each other. The tension of the spring is



NETTEKOVEN'S WATCH PENDANT KEY.



NETTEKOVEN'S SAFETY ATTACHMENT FOR WATCHES.

regulated by a nut, and is sufficient to hold the wheels in contact while the watch is being wound; but as soon as the winding is accomplished, the shank remains stationary, the upper wheel gliding over the lower one, even if the operator continues to turn the stem. This prevents the possibility of the main spring or other parts being broken. Fig. 4 shows the construction of the parts when applied to stem-winding watches.

The safety attachment for watches consists of a loop secured at its upper end to a cross bar which may be made to resemble any emblem, and which is rigidly secured to the garment. The lower loop part of the hook is attached to a bar (Fig. 2) secured to the edge of the pocket containing the watch. The free end of the hook is bent inward, and is in close contact with the garment. By pressing the garment inward, the watch chain can be slipped into the loop of the hook. It will be seen that a pull on the chain will not dislodge the watch, as the watch ring will strike against the hook and be held thereby.

The wearer can, however, at any time withdraw the watch by taking hold of it and pulling it out, as the chain has a free movement in the loop; or by taking hold of the chain with the fore and middle fingers and placing the thumb on the free end of the hook, for raising it so as to allow the chain to pass through.

SAFETY STIRRUP.

In the stirrup herewith illustrated, which is the invention of Mr. A. R. Parkison, of Monongahela City, Pa., the parts are so arranged that, should the rider be thrown, his foot will be released, while the pressure of the foot upon the side of the stirrup will cause the disconnection of the stirrup from its strap. The tread is made integral with one side bow, while to its opposite end is hinged a movable bow, whose upper end carries a pin that passes through an extension formed upon the arm of the head as represented in Fig. 3. Within the head is loosely mounted a shaft carrying a rectangular rack provided with pins on its upper arm. The stirrup strap passes through a slot formed in the head, and around the rack, as shown in Figs. 1 and 2. After the leather has been thus secured, the rack is held from turning by the pin upon the upper end of the movable bow. The strap may be permanently attached to the saddle and its length regulated at the stirrup. Should the rider be thrown, the pressure of his foot will throw out the movable bow to the position indicated by the dotted lines in Fig. 1, when the rack, should it be subjected to any pull, will be free to rotate and release the strap, and thereby disconnect the stirrup.

HOTEL REGISTER.

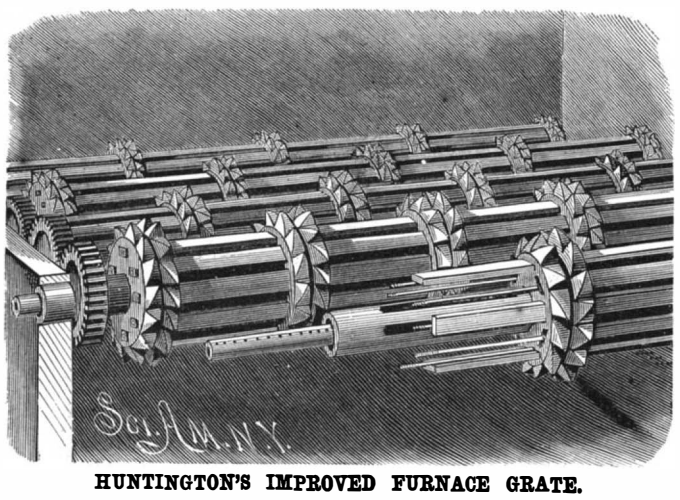
Within the case, directly behind two transverse openings in its upper face, are arranged two shafts, mounted in bearings in the sides, and each having at one end a crank handle. Passing through the openings and around the rollers is a strip of paper, the construction being such that when the upper shaft is turned the strip will be wound thereon and unwound from the lower roller. The rollers carried by the shafts are held in place by shields placed at either end of each roller. The strip of paper is divided into four parallel columns, the idea being to provide a separate column for the name of the guest, for his residence, for the time of his arrival, and for the number of the room to which he is assigned. Projecting diagonally from the upper end of the case is an ornamented panel, to receive the name of the hotel and other appropriate matter. Below the panel is a recess for holding pens and openings for ink wells. The case is pivoted upon a metal standard, so that it can be freely turned.

This invention has been patented by Mr. James W. Leasure, lock box 1420, Bradford, Pa.

IMPROVED FURNACE GRATE.

The sections are formed of toothed end pieces, with which are cast bars. The opposite ends of the bars are received in mortises in the sides of the next toothed wheels. Each section of the grate bar is thus made up of two wheels, from one of which the bars project and enter mortises in the other. The grate bar is formed of a series of such sections placed on a hollow slotted shaft and secured together by bolts passing through all the sections. The teeth on one wheel of a section point in a direction opposite to those on the other wheel, so that the work is the same, no matter in what direction the bars are revolved. The bars are revolved by suitably arranged cog wheels on the ends of the shafts. Inserted in the hollow shaft is a pipe which extends through the entire series of sections of the grate bar, and is apertured to permit the escape of water therefrom to the interior of the bar, to keep it cool and to furnish a certain amount of steam to the fire to improve the combustion and economize fuel. The wheels of adjacent bars alternate with each other, leaving spaces for the escape of ashes and clinkers, which are ground up and removed by the rotation of the wheels and bars.

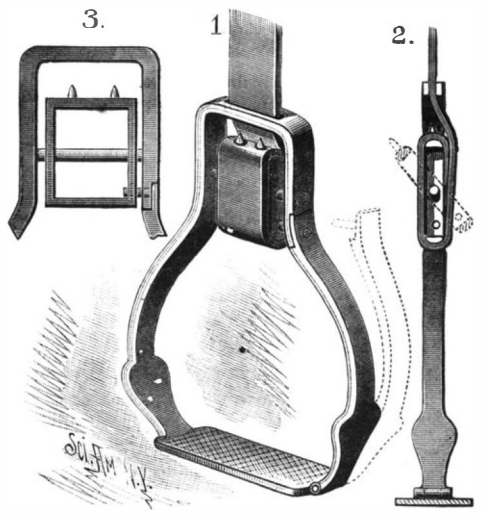
This invention has been patented by Mr. S. H. Huntington, of West Pittston, Pa.



HUNTINGTON'S IMPROVED FURNACE GRATE.

Silotvaar, a New Explosive.—Is it a Russian "Keely Motor"?

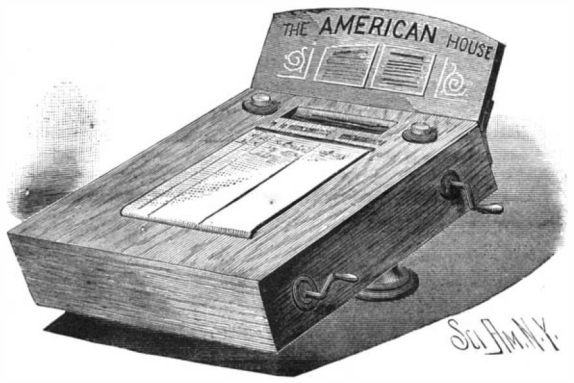
M. Rucktchell, a Russian engineer, has invented a new explosive, which he calls "silotvaar," with which experiments have been recently carried out at the camp of Krasnoie Selo, near St. Petersburg. As compared with ordinary gunpowder, the penetrative power of the new explosive, when used for cartridges, is stated to be ten times greater. The compound of which the explosive consists is still the secret of the inventor. The explosive, an exchange says, emits no smoke or heat, and the discharge is unaccompanied by any report. Since these experiments, the Russian war and naval authorities have had the new explosive examined and tested by experts, who, it is stated, have pronounced favorably upon it. It is further stated that a motive force may be generated with the explosive by means of an engine constructed by the inventor, for which he claims superiority over steam and gas engines. The inventor has patented both the explosive and the engine in several countries. If patented, the composition cannot be a "secret." On the whole, this reads, the *Mining Journal* thinks, like our own American Keely motor.



PARKISON'S SAFETY STIRRUP.

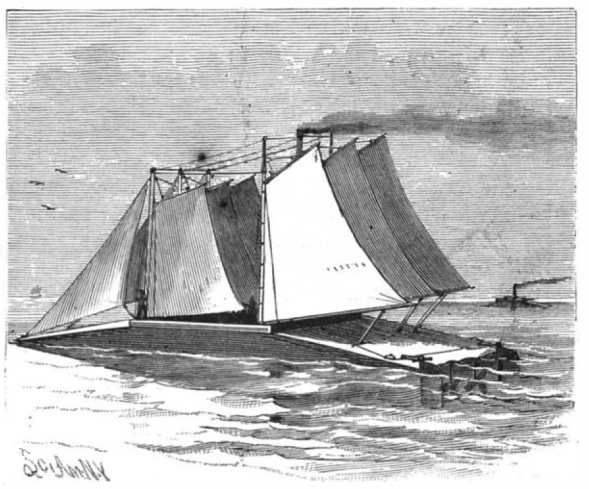
A NOVEL FORM OF VESSEL.

This vessel is rectangular in plan and cross section and double convex in longitudinal section and side elevation. The measurements in the following description may be regarded as suggested proportional dimensions. The hull is 180 feet long, with flat vertical sides, 12 feet high at their middle parts and tapering to a point at the water line. It is 60 feet wide, the bottom being flat in cross section, but curving gradually upward from the middle part to the ends. The middle third of the deck is flat, while the end



LEASURE'S HOTEL REGISTER.

thirds curve downward to meet the ends of the bottom. The vessel is provided with two or more stationary weighted keels, as may be required, but in all cases a keel is placed beneath the lower edge of each vertical side. Two or more rudders are used, controlled by chains in the usual way, and two or more masts may be employed, or the vessel may be driven by steam power. The interior of the vessel is divided into a number of water-tight compartments, and, if used for war purposes, the side compartments could be made shot proof by jute fiber, which would float even if full of holes. Drawing very little water, the vessel could enter any harbor. Oil or grain could be carried in bulk, thereby economizing in labor and cost of cans, barrels, or bags. It is evident that such a vessel would have great breadth of beam in connection with a very fine "entrance" or "run," and, as a war vessel, would produce a most formidable ram and have great steadiness as a gun platform.



O'GRADY'S NOVEL FORM OF VESSEL.

This invention has been patented by Mr. W. L. D. O'Grady, of 98 Maiden Lane, New York City.

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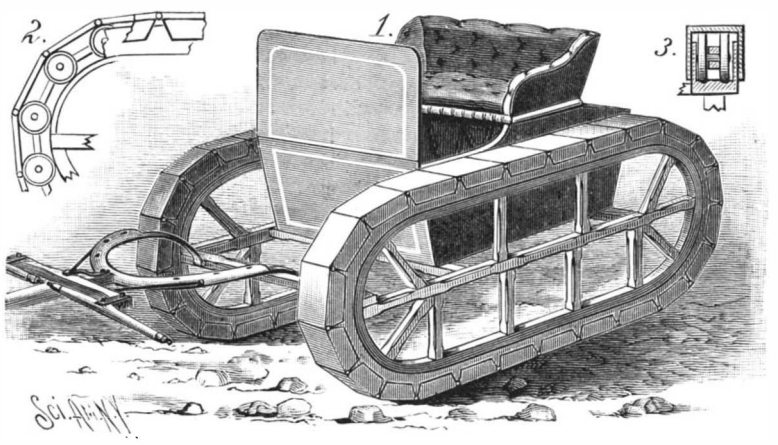
VEHICLE.

The object of the invention here illustrated is to obviate, as far as possible, the jolt, friction, and difficulty of propulsion inherent in that class of vehicles having for their running gear wheels and axles, to dispense with springs, and to obtain a smooth and easy movement of the vehicle. The endless tracks are composed mainly of anti-friction rollers, united by links to form an endless chain, as shown in Fig. 2. The side pieces of the body of the vehicle are oblong in form, are held parallel with each other by suitable framework, and are flanged to form guides for the wheels of the endless tracks, so that all danger of lateral displacement of the tracks is obviated.

The guards surrounding the wheels are made up of links of sheet metal, shaped as clearly shown in the perspective view, and hinged together to form a continuous chain to inclose the wheels. As the vehicle is drawn along the ground, the contact of the endless guards with the ground will cause the body to be drawn along the endless tracks, as it were, upon the oblong side pieces, the latter running upon the rollers. The tracks at the same time pass around the side pieces, over which they run with but little friction, thereby producing easy running, and, owing to the broad surface in contact with the ground, easy riding. This invention has been patented by Mr. Charles Dinsmore, of Warren, Pa.



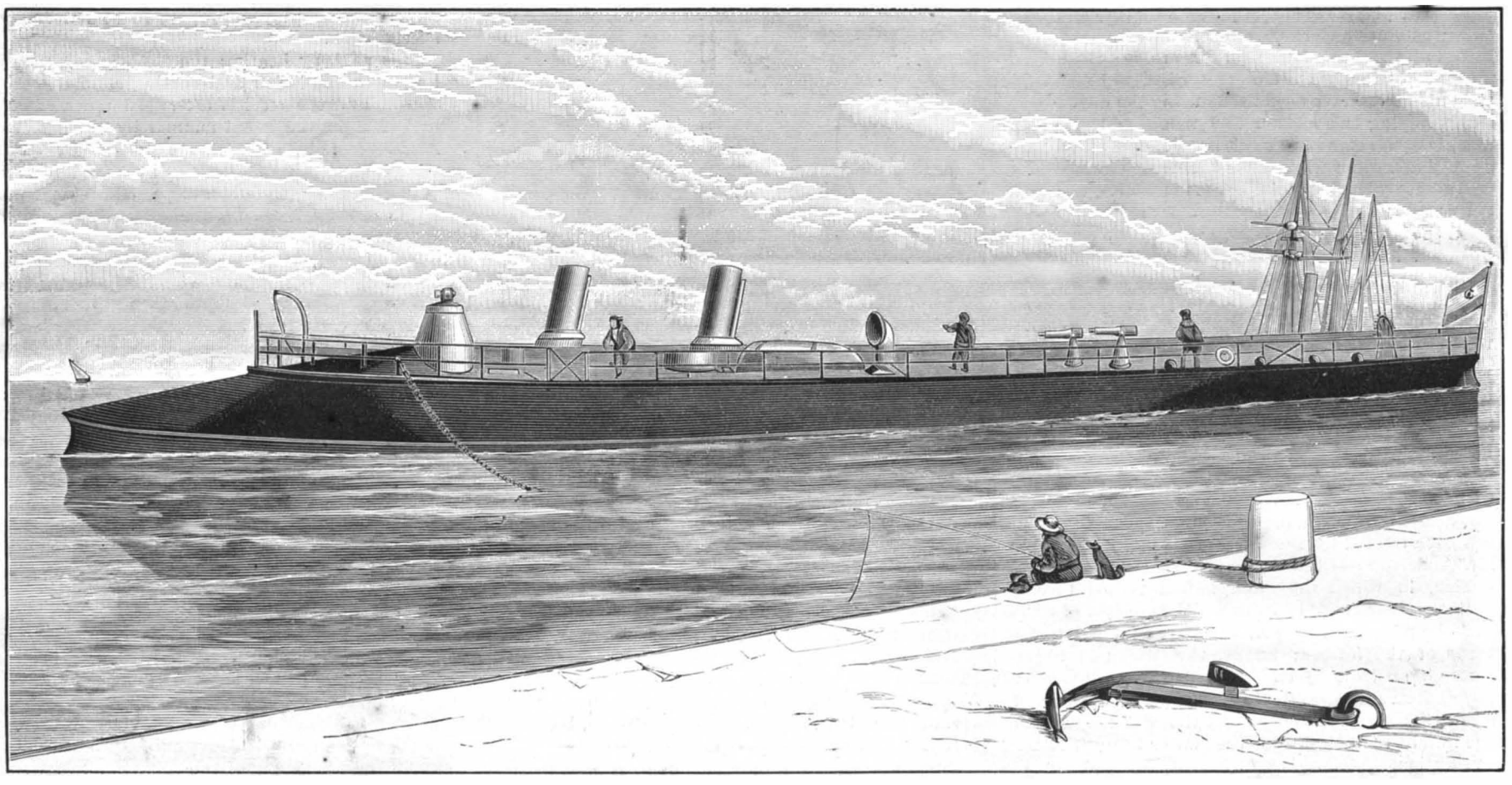
DINSMORE'S VEHICLE.

The Occupations of Great Men.

The *Medical Age* has been investigating this subject, and says that the father of Demosthenes was a blacksmith; of Euripides, a dealer in vegetables; of Socrates, a mediocre sculptor; of Epicurus, a shepherd; of Virgil, an innkeeper. Columbus was the son of a wool carder; Shakespeare, of a butcher; Luther, of a miner; Cromwell, of a brewer; Sixtus V., of a swineherd; Linnæus, of a poor country minister; Franklin, of a soap boiler; Rousseau, of a watchmaker; and Murat, of an innkeeper. The writer concludes that the mothers of these men may have been the source from which their genius was derived, and, indeed, it is known that some of them were women of more than ordinary excellence.

NEW TORPEDO BOATS.

The increasing importance of the question of our naval defenses, now before Congress for action, gives interest to the doings of other nations in this direction. Several new vessels have, within two years past, been added to the Spanish navy, and that government is now providing itself with a number of new torpedo boats. We here present the model of the very latest constructions of this class. They are vessels of the Austrian Falke type, constructed by Thornycroft & Co., London. Length, 147 ft.; width, 14·6 ft.; displacement, 147 tons; double screws; speed, 22 miles an hour. They have two torpedo tubes at the bow, and three repeating deck guns. Our engraving is from *La Ilustracion Espanola.*



NEW TORPEDO BOAT FOR THE SPANISH NAVY.

Danger of Water in Steam Pipes.

Many are not aware of the danger that ensues when condensed water is permitted to accumulate in steam pipes, and no means provided for drawing off, by suitable opening provided with cocks arranged or located at the lowest points in a line of pipe.

The danger arises from the fact that when the steam encounters a body of cold water, there is rapid condensation, causing a vacuum, and the violent rush with which the water is then driven along the pipe like a water hammer, against elbows or the casing of a valve, sufficient sometimes to drive a hole through the solid metal, as if it had been punched with a solid ram of steel. Connecting pipes between the boilers of a battery, a part of them having been cold for a few days, have been ruptured by opening the valves that closed the connection with the boilers under pressure of neglecting to properly drain the pipes. Men in charge of boilers have been seriously injured by neglecting these precautions. Not only valves have been ruptured, but steam pipes are sometimes split, in some cases for several feet of their length.

It has been proved beyond question that no steam fitter who neglects to provide for the easy and rapid removal of all water of condensation is fitted or competent to be trusted with the supervision of work requiring the intelligence and caution which has been shown to be necessary in laying lines of pipe for carrying steam.

There is no doubt that a reliable automatic steam trap which will drain the water off from the line will prevent these disasters; and it is the duty of persons in charge of the erection of steam lines to see that ample means are provided for preventing the accumulation of water. Every low part or place in the line should be provided with traps or drain cocks, ample to carry off in a few minutes any water in that part of the line.

It is often found that through false notions of economy the cocks placed for draining off the water are too small, and it often happens that the man who is charged with the duty is hurried, and the work is only half done. The best economy is to arrange so that a line of pipe can be quickly and easily drained, and, by this, the possibility of disaster is removed.—*Master Steam Fitter.*

Novel Health Treatment.

The variety of remedies and appliances for the treatment of maladies of every kind are not only numerous on the Continent of Europe, but some of them are very amusing The mud baths administered at many establishments have had quite a successful run, and now a novel anti-fat cure establishment has been started in Germany, which is described by a traveler who has inspected its working:

"Imagine to yourself a gentleman of aldermanic rotundity standing in a sort of treadmill and hard at work trying to mount an imaginary staircase, without ever getting above the first step, inasmuch as the upper ones are constantly receding under his weight. The physical exertion of ascending the continuously descending steps causes the unhappy climber to set in motion a system of bellows, which inhale the outer air and blow it full in his face. Instead of the common street air, however, the victim can also be made to inhale air impregnated with extract of pine and other forest trees, and oxygen, thereby procuring him, within the walls of the city, the illusion of filling his lungs with the invigorating air of high mountains. Besides all this, the steps are so constructed as to be placed perpendicularly, if desired, in imitation of a steep mountain.

Thus the patient obtains the exercise, and at the same time inhales artificially prepared oxygen, or it may be natural air impregnated with other health-giving properties.

Intensifying with Bromide of Copper.

Mr. Ives, of Philadelphia, gives an improved method of intensifying with bromide of copper and silver for negatives that are used for photo-lithography and similar processes. The author contends that the present method does not give such a density as is often desired for these processes, even if one repeats the operation, or blackens it with an alkaline sulphide. With the following method, however, a much greater density is obtained by simpler means. He recommends that, after the negative has become white by the application of the bromide of copper solution, it should be thoroughly washed, and placed in a weak solution of iodide of ammonia, which will turn the negative to a yellowish green color. The negative should be again washed, and the silver solution applied in the usual manner. This method gives an opaque and less actinic color than with the bromide of copper solution alone.

AN order has been issued in Lower Austria forbidding manufacturers and tradesmen to sell *nickel plated cooking vessels.* It is stated that vinegar and other acid substances dissolve nickel; and that this, in portions of one-seventh of a grain, causes vomiting, and is even more poisonous than copper.

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Laundry Hints.

A spoonful of oxgall to a gallon of water will set the colors of almost any goods soaked in it previous to washing. A teacup of lye in a pail of water will improve the color of black goods. Napkins should lie in lye before being washed; it sets the color. A strong tea of common hay will preserve the color of French linen. Vinegar in the rinsing water for the pink or green calicoes will brighten them; soda answers the same end for both purple and blue. To bleach cotton cloth, take one large spoonful of sal soda and one pound of chloride of lime for thirty yards; dissolve in clean soft water; rinse the cloth thoroughly in cold soft water, so that it may not rot. This amount of cloth may be bleached in fourteen or fifteen minutes.

TIME REGISTER.

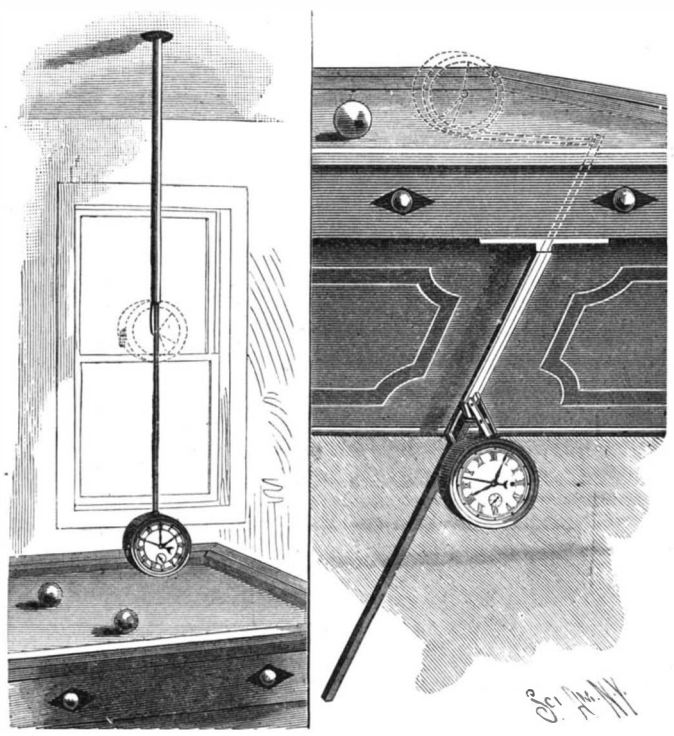
The important principle of this invention is that when the clock is placed in one position it stops, and when placed in another, or reverse position, it runs again.

It is applicable as a time register for billiard and other gaming tables, and for all kinds of machines or machinery used at intervals; such as dynamos, when it is necessary or desirable to have an account of the whole length of time such machinery is in use during the day or week. The application of this register to billiard tables is very simple and perfect. It may be attached under the edge of the table by an arm which telescopes, thus allowing the clock to be drawn out and laid over the table, as shown in the annexed engraving; or it can be attached to the gas fixture or suspended from the ceiling over the table by two brass tubes, one sliding inside the other, allowing the clock to be raised and lowered, as also shown in the drawing. When the clock is lowered or laid over the table, it stops running. When it is raised from the table, it commences to run. The table cannot be used while the clock is down, neither can the clock be raised from the table without starting to run, and continuing until lowered or laid across the table again. As a register for billiard tables, the clock is provided with three hands. In the morning, before play commences, all three hands are placed over the figure XII. As each set of players finish their play, the clock is lowered or brought over the table, the key inserted in the back, and the hour and minute hand turned back to the figure XII. again; the third hand keeps its position and records the whole time the table is used during the day, and is controlled only by the proprietor or person having the lock key.

The use of the register in this respect is threefold. The players see exactly how long they play, the attendant or clerk does not require to keep a record of the time, and mistakes are impossible. The proprietor has a close record of the whole time his tables have been used during the day.

In applying this register to dynamos and other machinery an eight day clock is used, and may be applied in various ways. The one most suggestive is to operate it by the belt driving the machine. When the belt is upon the loose pulley the clock stops, and when upon the tight pulley it runs, a slight cant from right to left or left to right being sufficient to produce this effect.

This register was invented and patented by Rudolf C. Wittmann, box 564, of East New York, N. Y., of whom further particulars can be obtained.



WITTMANN'S TIME REGISTER.

The Filtration of Water.

Mr. W. Anderson lately read a paper before the Society of Arts "On a System of Purifying Water by Agitation with Iron, and by Sand Filtration." The process described is one that has been carried out with good results at Antwerp, where the water supply derived from an impure source, the River Nethe, has been treated by the Bischof spongy iron process. Mr. Anderson testified to the excellent working of this system, in which the water is first passed through ordinary filter sand, beneath which is a layer of coarse gravel and granular iron, one part of the latter to three of the former; finally, the water is filtered through an ordinary sand bed. The condition of the mixed iron and gravel after continued use demonstrates in a very striking manner the chemical action of the iron in removing from the water impurities held in solution. After this system had been in use at the Antwerp Water Works for four years, an extension of the supply became absolutely necessary; and as the acquisition of new land for filter beds would have been attended with a very heavy expenditure, in addition to the purchase of 900 tons of granular iron, Mr. Anderson determined to carry out experiments upon a suggestion that had been made some years previously by Sir Frederick Abel. This suggestion was to the effect that excellent results might be obtained by agitating the water to be purified with iron particles in such a manner that the iron surfaces should be brought into intimate contact with the mass of water being treated. Preliminary trials having indicated very promising results, the new system was tried on a practical scale. Large iron cylinders are mounted horizontally on hollow trunnions fitted with pipes by means of stuffing boxes and glands, and a slow rotating movement is imparted to the cylinders by means of spur gearing.

One pipe, serving as an inlet, delivers the water into the cylinder against a disk which acts as a distributer, and the outlet pipe is fitted, also within the cylinder, with an inverted funnel, up which the water passes so slowly as to allow of the precipitation of the iron particles. The inside of the cylinder is furnished with curved intercepting and baffling plates, and they are filled to one-tenth of their capacity with iron borings. The cylinders at Antwerp are 5 feet in diameter and 15 feet long. They are driven at a speed of one revolution a minute, and are capable of purifying 500 gallons of water per minute. The diameter of the inlet and outlet pipes is 10 inches. The charge of iron borings for each cylinder is 3½ tons. This system was commenced at Antwerp in March, 1885, and has been in successful operation ever since; one incidental advantage attending its introduction having been that the iron and gravel filter beds were changed into ordinary sand filters, upon which the water was discharged from the cylinders. The storage capacity of the works was doubled by this change. The results of purifying water by agitating it in contact with finely divided iron are stated by Mr. Anderson to be as follows: 1. The chemical nature of the organic matter is changed, and existing albuminoid ammonia is reduced from one-half to one-fifth of its original amount. 2. The water is softened by the precipitation of the carbonate. 3. Infusorial life is largely destroyed and modified. This system is now in successful operation at Gouda and Dorderecht, in Holland, and at the works of MM. Cail & Co., in Paris.

The Prevention of Scarlet Fever.

Scarlet fever is a disease whose prevalence does not seem to be greatly affected by improvements in drainage, water supply, or by better modes of living generally. This is shown by English statistics. For the last twenty-five years the annual mortality in all England from this disease has kept above 12,000. In London the mortality, until within the last two years, has been over 2,000. In New York city the mortality in 1871 was 791; in 1875 it was 515; in 1883 it was 744; and in 1885, 559.

It is only by isolation and disinfection, therefore, that this disease can at present be checked; but there is already considerable evidence that such measures are helpful.

Thus, in London, in the last two years, since more efficient means have been adopted for isolation, the mortality rate has fallen to 700 in 1884–85, while for the present year it has been only at the rate of about 400.

At Salford, England, according to Mr. John Gatham, the annual death rate from scarlet fever used to be about 135 per 100,000 of the population. Since the establishment of a fever hospital, and the passing of a compulsory notification act, the mortality has been only about 50 per 100,000.

It thus appears that by means of isolation, by the establishment of fever hospitals with the enactment of a proper compulsory notification law, scarlet fever can be reduced in amount about one-third. And this seems to be the only way at present by which we can seriously affect the prevalence of the disease.

It may be said that in New York we have both these things, and yet no marked effect is produced. To this the answer is that New York, owing to its crowded population, is under peculiarly unfavorable circumstances; and again, it is by no means certain that we may not claim a diminution in the prevalence of the malady; for our population has increased 300,000, while the scarlet fever mortality has not increased, the annual average being, perhaps, even less than it was a decade ago.—*Med. Record.*

Business Amiability.

Bishop Ames, of the Methodist Episcopal Church, once delivered a sermon in Washington in the presence of members of Congress, the President, and a large number of other Government officials, on the subject of amiability in business. His text related to the personal characteristics of the prophet Daniel, the leading characteristic of whom was amiability of deportment, winning to Daniel by his traits nearly all with whom he came in contact. From this starting point the Bishop proceeded to sum up some of the observations of his own long life, showing how men of his acquaintance had succeeded in their several occupations by the practice of habitual courtesy without insincerity, this trait, of course, accompanied by honesty and industry. "Other things being equal," said the great preacher, "I always prefer to buy my goods at the store from that clerk who has a friendly word and a kindly look of recognition. So, too, I prefer to deal with that business man who has a pleasant demeanor, and treats me like a brother. Other things being equal, such a clerk and such a business man will win where others of different social qualities will fail."

The good Bishop long since passed to final rest, but the lesson he sought to impress upon the young, on the occasion of which we speak, is as important now as it was then, and employer and employed in all branches of trade and industry could heed it with profit. In politics, the lack of amiability has sent many a candidate to the rear, and in business depending upon the voluntary favor of the public (and what business does not?) it marked the line between success and failure for many a firm. Courteous treatment of the rich and poor alike thus has not only a commercial value above estimate, but it comes very near to the fulfillment of a divine command. —*Laundry Journal.*

Schaefer's Compound for Steel.

BY S. LLOYD WIEGAND.

This compound is the subject of letters patent of the United States, numbered 341,173, and dated May 4, 1886. It consists of resin, linseed oil, glycerine, and powdered charcoal, heated and intimately mixed in the proportion stated in the specification.

It is used by heating the steel to a clear red heat, and immersing and coating it in the compound, and the steel is afterward reheated and hardened in the usual manner by quickly cooling it.

Burned cast steel is restored to its original condition, and the softer grades of steel acquire the properties of cast steel, by being treated as above stated. Tools made from Bessemer steel, which is incapable of being hardened, are, after treatment with this compound and hardening, capable of cutting cast steel.

Tools so treated possess a greater durability than before, and are capable of cutting castings which resist the best of ordinary cast steel tools.

The grain of steel exhibited by fracture of tools so treated, as compared with the same material before treatment, shows a difference analogous to that between the fine cast steel and coarse or blistered steel.

The compound applied to gray castings and malleable iron castings imparts a degree of hardness to them superior to ordinary casehardening.

It is not attended in use with the unpleasant and deleterious fumes incident to casehardening compounds containing hydrocyanic acid, and is much less expensive.

Specimens of different materials in their normal state, and also as treated with this compound and hardened, were submitted, properly labeled, which conveyed a clearer conception of the effect than could be stated in language.

In order that the facility of application and its effect may be seen, a forge, with fuel and bars of steel and other metal and a supply of the compound, were submitted, by means of which the members who felt inclined personally tested it after the close of the meeting.

The compound has been introduced into practical use in many manufacturing establishments in this city, with uniformly satisfactory results.—*Jour. Fr. Inst.*

Use of Compressed Air.

Mr. Preece states that in some of the British post offices a great deal more air power than electrical power is used. In London, Manchester, Liverpool, and Glasgow, all the telegrams were transmitted by air power, and the use of air pressure for that purpose had been applied for thirty years.

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THE FIRST TYPE WRITING MACHINE.

(*Continued from first page.*)

or dictation is done almost as fast as one can speak; and thirty duplicates may be simultaneously printed. Besides the mechanism just named, there are on the market the Caligraph and other most excellent machines, working on the same principle. Moreover, there are various forms of type writers, acting on different principles and doing good work, though perhaps lacking in speed or means for duplication.

The first example of a type writer was a model machine made by Mr. Beach in 1847. It printed upon a sheet of paper, supported on a roller, carried in a sliding frame, worked by ratchet and pawl, had a weight for running the frame, letter and line spacing keys, paper feeding device, line signal bell, and carbon tissue. It had a series of finger keys, connected with printing levers, which were arranged on a circle, and struck at a common point on the roller. This machine worked very well, but the quality of its printing did not satisfy the inventor's critical eye. So he laid it aside for improvement at a future time. Meanwhile, he constructed another form of the invention, namely, a type writer to print in raised letters, without ink. This is the machine illustrated in our engravings. It was first publicly exhibited in operation at the Crystal Palace Exhibition of the American Institute, in the fall of 1856, where it attracted great attention and took the highest prize—the gold medal—as one of the most novel exhibits of the occasion.

Referring to our engraving, it will be seen the embossed letters are printed on a strip of paper, which runs centrally through the machine.

The printing levers are arranged in a circle, in pairs, one riding on the other. When the operator, Fig. 1, presses a letter key on the keyboard, a pair of printing levers, answering to the letter key, are brought together, the paper being between them. The printing types are at the extremities of the levers, one lever having a raised letter and its mate a sunken or intaglio letter. The construction and action of the machine will be readily understood by an examination of the engraving. The paper is drawn from a reel (seen in Fig. 1) by a ratchet wheel that feeds the paper on each up-stroke of the printing levers.

Any desired change in the spacing of the letters is effected by turning the pin seen at the right, Fig. 2. Fig. 1 shows the machine as it appears in operation; Fig. 2 a central sectional elevation of the mechanism removed from its case. On the roll of paper above is shown the style of letter produced. Fig. 3 is a perspective of the machine removed from its case. This machine does elegant work, operates with great rapidity, and the alignment of the lettering is almost perfect. It is made in brass, and presents an ornamental appearance.

The patent for this invention was granted June 24, 1856, expired and became public property in 1870. The patent drawings show both the single and double printing keys, for doing either ordinary ink or rubber printing or embossed letters; also the carbon ribbon, device for moving the same, a paper feeding device, with which all the keys are connected in common, whereby the paper is moved whenever any key is pressed.

Speaking of the progress of the type writer industry in general, Mr. J. B. Huling, in an able contribution to the *Inland Printer*, makes the following observations:

The facilities of all who can make any machines whatever are pushed to the utmost, and even then the foreign field cannot be canvassed for orders, for the entire output seems to be required for the trade of our own country. It is estimated that 50,000 machines of all kinds have so far been manufactured, and that about 75 per cent of that number are in current use, the rest having been worn out or otherwise destroyed. The capacity of factories now employed in building type writers is from 10,000 to 15,000 machines per annum. Where the type writer has once been found really requisite, it will never be dispensed with.

Type writers have been of particular benefit to professional men, such as clergymen, lawyers, editors, and litterateurs, who usually are the most persistent pen users; but in facilitating commercial correspondence they find their greatest usefulness, and thence arises the demand, now so great that it cannot be met fast enough. Business men, in particular, have special reasons to wish for clearness in their papers, as monetary loss may often be caused by slight obscurities.

No large business house may be found in these days without a type writer of some kind. To lawyers they have been of most marked aid, mainly through the ability to produce manifold copies at a single impression.

Most conspicuously, the existence of type writers has contributed to encourage the study of short hand, so that opportunities for instruction in that difficult art were never so numerous before. There are ten teachers for one formerly, and no institution educating in commercial matters is without one, while they find employment in many public schools. Note taking clerks are demanded in every branch of trade, and their services have been most potent in swelling the bulk of general correspondence and increasing the volume of professional papers.

In all the larger cities a great many persons are employed as copyists in type writing altogether, usually in connection with shorthanders, who solicit all kinds of dictation jobs in the courts and offices, and even going to small business houses by the hour, where a permanent clerk could not be maintained. To become most proficient in this kind of work requires intelligence and practice.

Manifolding, or producing duplicate copies at once, in all type writers depends on the ability to impress with force from hard faced type. A book of alternate white and colored leaves is made, and put in the type writer as a single sheet. Black is the ordinary color used. A paste, principally of pure carbon or lamp-black and tallow, is smeared on one side of a tough tissue paper, and hence arises the common designation of all transferring sheets as carbon paper. The colored side is put against the leaf to be printed on. The first or outside leaf is printed through the ribbon, and the inner white leaves receive a set-off from a colored one with each impression. Very thin or soft paper makes the best copies, and from three to six is the ordinary production. For special purposes thin oiled paper is employed altogether for duplicates, with double carbon sheets, setting off on both sides, the work being readable through the oiled sheets. The ribbon is removable, to save its interference with the sharpest impressions. From twenty to thirty good copies have been thus secured.

A Woman Engineer.

Miss Mary S. Brennan is matron of the Mount Auburn Young Ladies' Institute, Cincinnati, O. She is a college graduate, a well read and highly cultured young lady, of retiring disposition, but full of that American ambition which characterizes its leading women.

As matron of the institute, the duties of heating the building devolved upon her: and, owing to some difficulty, she resolved to have the machinery overhauled. She had made practical mechanics one of her favorite studies, and was well versed in the construction of boilers and machinery. She drew new plans for a furnace, and took the boiler from under the building and placed it under one of the porches. She personally supervised the removal and construction of the furnace, and then asked for permission to take full charge, which was given; and she went before the board of inspectors, and was examined, and granted a first-class license as steam engineer.

Miss Brennan has taken full charge of the engine. She has a fireman who is under her orders, and all the machinery is daily inspected by her, and all repairs are made according to her plans and directions.

The board of inspectors speak very highly of Miss Brennan's examination, and say a better qualified applicant was never before them. The license, the first granted to a woman, was issued October 16, 1886, and reads as follows:

STATIONARY ENGINEER'S LICENSE.
ISSUE NO. 837.

By authority of the city of Cincinnati, the undersigned, Inspectors of Stationary Engineers for the city of Cincinnati, certify that Miss Mary Brennan, having been duly examined touching her qualifications as an engineer of stationary steam engines, is a suitable and safe person to take charge of and operate stationary engines, boilers, or steam generating apparatus, for the city aforesaid, and do license her to act as such for one year from this date, unless the license be sooner revoked or suspended.

The above named is hereby licensed to perform the duties of engineer at the Young Ladies' Institute, Mount Auburn. Given under our hands and seal this 16th day of October, 1886.

E. D. BATEMAN, J. W. ROSS, *Inspectors.*

Successful Descent of the Amazon River.

Dr. H. H. Rushby, the eminent botanist, for nearly two years past has been exploring the resources of Peru, Bolivia, and Chili, with respect to the supply and cultivation of cocoa leaves. His travels have been made on behalf of Parke, Davis & Co., of New York and Detroit, the prominent manufacturers of the new alkaloid known as cocaine. After finishing his cocoa researches, the doctor was authorized by Messrs. P., D. & Co. to return by way of the Amazon River, with a view to obtaining scientific information concerning the flora and other features of the region. Dr. Rushby's mission has just been brought to a close by a successful descent of the great river. From the mountains of Bolivia, he floated in a canoe a distance of some 3,500 miles, reaching Para, in Brazil, a few days ago. This must have been a remarkable journey, full of perils and adventures. We await with much interest the particulars of Dr. Rushby's experience and the scientific results of his travels.

FLAT turnips constitute one of the best crops to raise in a garden after an early crop has been secured. A use can be found for them in the house as well as the barn.

Correspondence.

Combustion of Powder Outside of the Gun.

To the Editor of the Scientific American:

"Expulsion of Unburned Gunpowder from Cannons." Admitting the correctness of your remarks concerning the wear sustained by guns from the friction of unburned powder, I think it advisable to point out that the outer projections in your engraving are not only due to the combustion of powder outside the muzzle, but also to pieces of ignited semi-carbonized asbestos cloth or other material used to wrap the charge. Indeed, I question that the most progressive gunpowder would travel eight times the length of the gun (as per engraving) before complete combustion.

CHARLES A. SERRE, F.C.S.

Brooklyn, December 4, 1886.

Effect of the Earthquake on the South Carolina Railroad.

To the Editor of the Scientific American:

Your quotation and illustration from the *Railroad Gazette*, on the effects of the earthquake on the South Carolina Railroad, is interesting. There is, however, in my opinion, a very erroneous theory expressed as to the cause of the bending of the rails in reverse curves by the *oscillation* of *east and west forces.*

The true cause, as I believe, is the contraction of the earth crust in settling, to suit inner shrinkage, by reason of radiation and consequent cooling, thus shortening distances and bringing such end thrust on the rails that they are compelled to bend.

If lateral oscillations were to bend the rails, they would also bend the roadbed and the sides of the ditches, which, I understand, was not the case.

The sliding of the cross ties to one side of the roadbed shows that the rails moved the ties, and that the cross ties did not move the rails. Everything goes to show that the end thrust on the rails produced the bends.

Some, at first, contended that the rails were elongated by the wave motion—a far-fetched idea; for all agree that the earth does contract, and end thrust is, therefore, a natural consequence.

Perhaps, too, the space left between the rails may, in some places, be closed too much for next summer's expansion. Railroad men had better examine.

H. E. EADDY.

Johnsonville, S. C., November 26, 1886.

Curious Phenomenon in Venezuela.

To the Editor of the Scientific American:

The following brief account of a recent strange meteorological occurrence may be of interest to your readers as an addition to the list of electrical eccentricities:

During the night of the 24th of October last, which was rainy and tempestuous, a family of nine persons, sleeping in a hut a few leagues from Maracaibo, were awakened by a loud humming noise and a vivid, dazzling light, which brilliantly illuminated the interior of the house.

The occupants, completely terror stricken, and believing, as they relate, that the end of the world had come, threw themselves on their knees and commenced to pray, but their devotions were almost immediately interrupted by violent vomitings, and extensive swellings commenced to appear in the upper part of their bodies, his being particularly noticeable about the face and lips.

It is to be noted that the brilliant light was not accompanied by a sensation of heat, although there was a smoky appearance and a peculiar smell.

The next morning the swellings had subsided, leaving upon the face and body large black blotches. No special pain was felt until the ninth day, when the skin peeled off, and these blotches were transformed into virulent raw sores.

The hair of the head fell off upon the side which happened to be underneath when the phenomenon occurred, the same side of the body being, in all nine cases, the more seriously injured.

The remarkable part of the occurrence is that the house was uninjured, all doors and windows being closed at the time.

No trace of lightning could afterward be observed in any part of the building, and all the sufferers unite in saying that there was no detonation, but only the loud humming already mentioned.

Another curious attendant circumstance is that the trees around the house showed no signs of injury until the ninth day, when they suddenly withered, almost simultaneously with the development of the sores upon the bodies of the occupants of the house.

This is perhaps a mere coincidence, but it is remarkable that the same susceptibility to electrical effects, with the same lapse of time, should be observed in both animal and vegetable organisms.

I have visited the sufferers, who are now in one of the hospitals of this city; and although their appearance is truly horrible, yet it is hoped that in no case will the injuries prove fatal. WARNER COWGILL.

U. S. Consulate, Maracaibo, Venezuela,
November 17, 1886.

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PETROLEUM AS A FUEL FOR STEAM TRICYCLES.

Mr. Louis Lallemand, a skillful mechanic of Vassy, has just constructed a steam tricycle, to be heated by petroleum, and as the question of terrestrial mechanical locomotion is one that interests a large number of readers, we shall describe the apparatus.

The length of the tricycle, as well as its extreme width, is 3½ feet. The boiler is of welded iron plate. Its height is 2 feet, its external diameter is 12 inches, and its total capacity is about 4 gallons. It is provided with 30 brass tubes, and serves as a frame for the engine, the cylinder of which is 2¾ inches in diameter, with a stroke of 4¼ inches. In the center of the boiler there is a copper cylinder, forming a steam dome. The pressure gauge is placed to the left of the cylinder, under the eye of the driver, and the feed pump is to the right. The escape pipe enters the smoke stack and quickens the draught.

The throttle valve is within reach of the left hand, as is also the lever of a Prony brake fixed upon the axle. Another hand lever, fixed to the foot rest, is designed to serve as a bearing point.

The driver's right hand rests upon the steering winch, and has within its reach a lever for changing the velocity, that permits of throwing either of the two driving pulleys into gear. These latter are driven by the shaft of the engine through the intermedium of pitch chains.

The two large wheels are 3½ feet in diameter, and the small one 1¾ foot. They are provided with a rubber tire, in order to prevent noise.

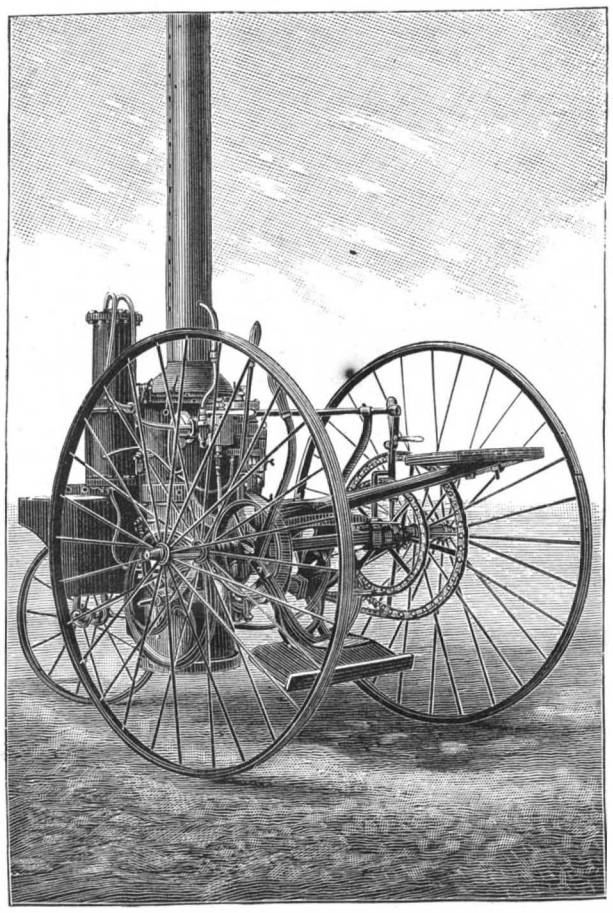
The water tank, which has a capacity of about seven and a half gallons, is situated in front of the generator, and partially covers the front wheel. The petroleum reservoir, which holds 2¼ gallons, is situated over the tank.

The fire box, which is of peculiar and very simple structure, is suspended from the generator, and always keeps a horizontal position, whatever be the slope of the road.

The petroleum enters the fire box through a flexible tube, and the fire is regulated at will through the intermedium of a distributing cock within reach of the driver.

The total weight of the apparatus, empty, is 500 pounds. The consumption is about three and a quarter gallons of water and three and a half pints of petroleum per hour. It takes about ten or twelve minutes to get up a pressure. Upon a good road, a speed of from 7 to 9 miles per hour may be obtained.

Mr. Lallemand has already made four trials of this tricycle, each of which lasted 12 minutes. The distance run over in each of these was about two miles, and the gradients ascended never exceeded 3 inches to the foot. On a level road, a pressure of two atmospheres suffices to run the apparatus at a speed of from 3½ to 4½ miles per hour. The constructor has not as yet been able to perform more prolonged experiments, as up to the present he has not obtained permission to run his apparatus in the streets. According to him, the use of petroleum is very advantageous as regards the regulation of the production of steam and as regards the quickness with which a pressure may be obtained; but in France this product is still too dear to prove economical.—*La Nature.*



A STEAM TRICYCLE HEATED WITH PETROLEUM.

Mechanism of the Heart.

In Dr. B. W. Richardson's recent Cantor Lectures on "Animal Mechanics," speaking of the mechanism of the heart, he described the number of the pulsations of the heart in different animals—in fish, frog, bird, rabbit, cat, dog, sheep, horse—and made a few comments on the remarkable slowness of the heart—40 strokes per minute—in the horse. Then the number of pulsations in man at various periods of life, and at different levels, from the level of the sea up to 4,000 feet above sea level, was brought under review, and was followed by a computation of the average work performed by the heart in a healthy adult man. The work was traced out by the minute, the hour, and the day, and was shown to equal the feat of raising 5 tons 4 cwt. one foot per hour, or 125 tons in twenty-four hours. The excess of this work under alcohol in varying quantities formed a corollary to the history of the work of the heart, Parkes' calculation showing an excess of 24 foot tons from the imbibition of eight fluid ounces of alcohol. The facts relating to the work of the heart by the weight of work accomplished was supplemented by a new calculation, in which the course of calculation was explained by mileage. Presuming that the blood was thrown out of the heart at each pulsation in the proportion of 69 strokes per minute, and at the assumed force of 9 feet, the mileage of the blood through the body might be taken at 207 yards per minute, 7 miles per hour, 168 miles per day, 61,320 miles per year, or 5,150,880 miles in a lifetime of eighty-four years. The number of *beats* of the heart in the same long life would reach the grand total of 2,869,776,000.

The Length of a Step.

Dr. Gilles de la Tourette has recently published a monograph upon normal locomotion and the variations in the gait caused by diseases of the nervous system. He found, from a comparison of a large number of cases, that the average length of a pace is, for men, 25 inches; for women, 20 inches. The step with the right foot is somewhat longer than that with the left. The feet are separated laterally in walking about 4½ inches in men, and about 5 inches in women. The ataxic gait is characterized by an acutal shortening of the pace coinciding with an apparent lengthening, and by a considerable increase in the lateral separation of the feet.

The Management of Lamps.

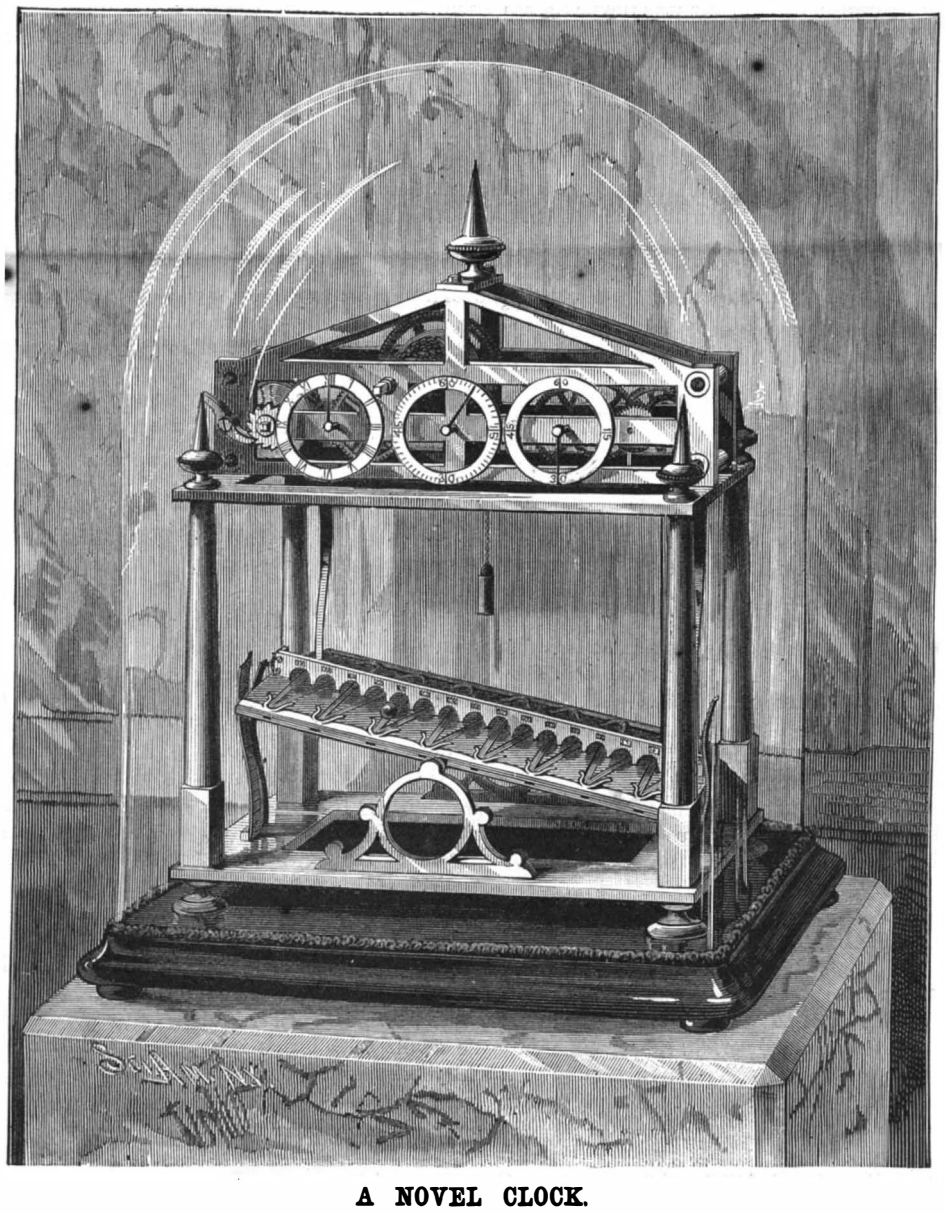
Some one has written some directions for treating lamps, and it so accords with the experience of another that we present them herewith. To insure good light, the burners of petroleum lamps should be kept bright. If they are allowed to become dull, the light is uncertain, and, owing to the absorption of heat by the darkened metal, smoke is the result. Once a month place the burners in a pan, covering them with cold water, to each quart of which a tablespoonful of washing soda should be added, and also a little soap. Boil slowly for one or two hours, and at the end of this time pour off the blackened water. Then pour enough boiling water into the pan to cover the burners, adding soap and soda in the same proportions as before. After boiling again a few minutes, pour off the water, rinse the burners with clear hot water, and rub dry with a soft cloth. The burners must be perfectly dry before the wicks are introduced. Should the wicks become clogged with the particles of dust floating in the oil, and new ones not be desired, they may be boiled in vinegar and water, dried thoroughly, and put back in the burners. If wicks have done duty all winter, they should be replaced by new ones in the spring. Nickel burners may be boiled as well as brass ones. Time spent in the care of lamps is never wasted. A perfectly clean lamp, that gives a brilliant light, is a great comfort. What more cheerless or depressing than an ill-kept lamp, which gives forth an unsteady, lurid, sight-destroying flame? The paper roses, guelder roses, and chrysanthemums, so popular for decorative purposes, are admirable for placing in the lamp chimneys to keep out the dust during the day, and the wicks should be turned a little below the rim of the burner, to prevent exudation of the oil.

A NOVEL CLOCK.

The novelty of the clock which is here illustrated consists principally in what we might term the escapement. Beneath the main mechanism is placed a tilting table pivoted upon studs projecting from the center of its long sides, so that it is free to have a seesaw movement. Upon the upper surface of the table is formed a zigzag path or groove in which travels a small steel ball. The path is made up of sixteen divisions, so that the ball, starting at the elevated end of the groove, passes across the table, forward and back, until it reaches the lower end, which is then elevated to enable the ball to run back to the starting point, which is again raised, and so on.

Attached to one end of the table is a rod leading upward to an arm placed at right angles on the end of a shaft driven in the usual way. When the ball reaches the depressed end of the table, it strikes a spring which releases a catch holding the shaft, which is thereby permitted to make a half turn, and its arm is correspondingly moved to raise or depress, as the case may be, that end of the table to which the connecting rod is attached. The ball then runs down the table, strikes a similarly arranged spring at the opposite end, when the movements are repeated and the position of the table again reversed. It takes fifteen seconds for the ball to travel from one to the other end of the table. It is evident that if the inclination of the table be varied, the time occupied by the ball in descending will be either increased or diminished, and the clock thereby regulated. This is accomplished in a most simple and effective way by slotting the arm to which the upper end of the connecting rod is attached, so that by placing the holding screw nearer to or further from the shaft, the inclination of the table may be varied as necessary.

The clock is provided with three separate dials or faces; the hand in front of the one to the right makes a revolution in one minute, so that at each change of the table it moves around one-quarter or fifteen seconds; the center dial marks minutes, and the left hand one, hours.



A NOVEL CLOCK.

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THE GYMNOTUS ELECTRICUS, OR ELECTRIC EEL.

For two months of the present year, an electric eel was kept in one of the aquaria at Eugene Blackford's establishment in Fulton Market, where it was the source of much amusement, as well as of a certain amount of distress, by the shocks it gave to those of an investigating or curious mind. Toward the end of its captivity the writer received one of its shocks. It was

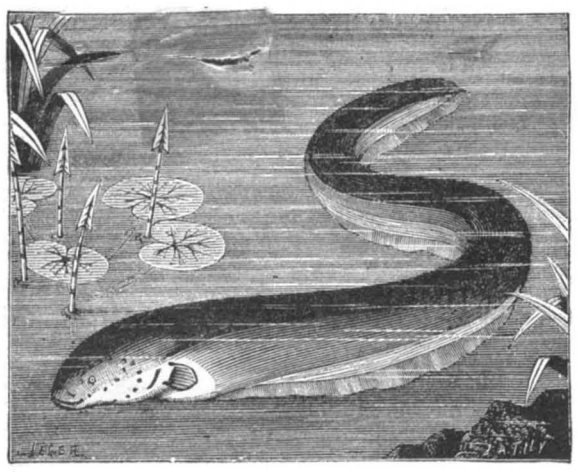


Fig. 1.—THE GYMNOTUS ELECTRICUS.

but a feeble one—comparable to that from a pint Leyden jar. The fish was then growing weak, and shortly afterward it died. Thus the shock could only be considered an indication of what it might do if in good health. A snapping turtle which was in the same compartment with it was once so badly shocked that for ten minutes it floated upon the surface of the tank senseless.

By the kind permission of Mr. Blackford, the eel was dissected. This was an operation of much interest, as the eel was the largest one he had ever had possession of.

Its general external appearance is exceedingly well represented in the cut. On cutting it open, the first thing that impressed one was the disproportionate size of the electric organ. The fish was 34 inches long and weighed 3⅛ pounds, and one-seventh of this weight was represented by its battery. The abdominal regions were confined to the forward part of the body, next to the head. The rest was all muscle, bone, and electric organ. The cut, Fig. 2, shows this organ as nearly as possible in its position in the body

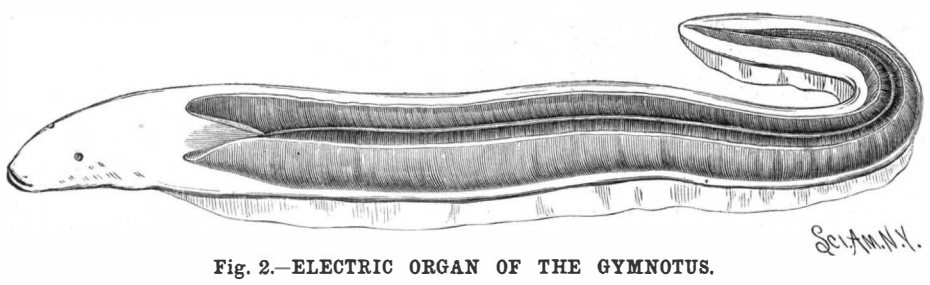


Fig. 2.—ELECTRIC ORGAN OF THE GYMNOTUS.

of the eel. It was sketched from the actual organ, and is a most interesting study. In Fig. 3 is shown a general section of the body, in which the parts marked E are the main body of the organ, while subsidiary divisions of the same are seen at *n* E and *e*. The microscopic section of the cellular tissue of the organ given in Fig. 4 shows what an immense active surface may be contained. Though this fish was an unusually fine one, a length of five or six feet is often attained. Its exact place in the kingdom of fishes is not satisfactorily settled, as it differs in many respects from the true eels. Its fins, confined to pectoral and anal, are covered with a thick skin. It has no dorsal, ventral, or caudal fins. Its vent is very far forward, just back of the jaw.

Michael Faraday's researches in the matter of the electricity of the Gymnotus are classic. His paper detailing the result of his experiments was read before the Royal Society on December 6, 1838. It may be consulted in the collection of his "Experimental Researches in Electricity," published by Quaritch in 1844, and recently reprinted in fac-simile.

He collected electricity under different circumstances, and tried many experiments with it. He used two kinds of collectors. In one of them, a copper disk, one and a half inches in diameter, was brazed to a copper rod fifteen inches long, with a copper cylinder for handle, the rod being insulated with a thick India rubber tube. In the other, a plate of copper, eight inches long by two and a half wide, was bent into a saddle shape, and its outer surface covered with caoutchouc. A wire was brazed to it and insulated by a rubber coating. With the first kind of conductors, the handles being wet, shocks were obtained when one collector was held in each hand and applied to different parts of the fish. The saddle collectors, properly applied, gave current enough to deflect a galvanometer that was not very sensitive. With a helix of twenty-two feet of fine silk-covered wire wound on a quill and placed in the circuit, a wire was magnetized, and its polarity indicated a direction of current from the anterior to the posterior parts of the animals. Iodide of potassium was readily decomposed, iodine appearing at the end of the wire connected to the fore part of the Gymnotus. By carrying out this line of experimentation, he ascertained that "within certain limits the condition of the fish externally at the time of the shock appears to be such that any given part is negative to other parts anterior to it, and positive to such as are behind it."

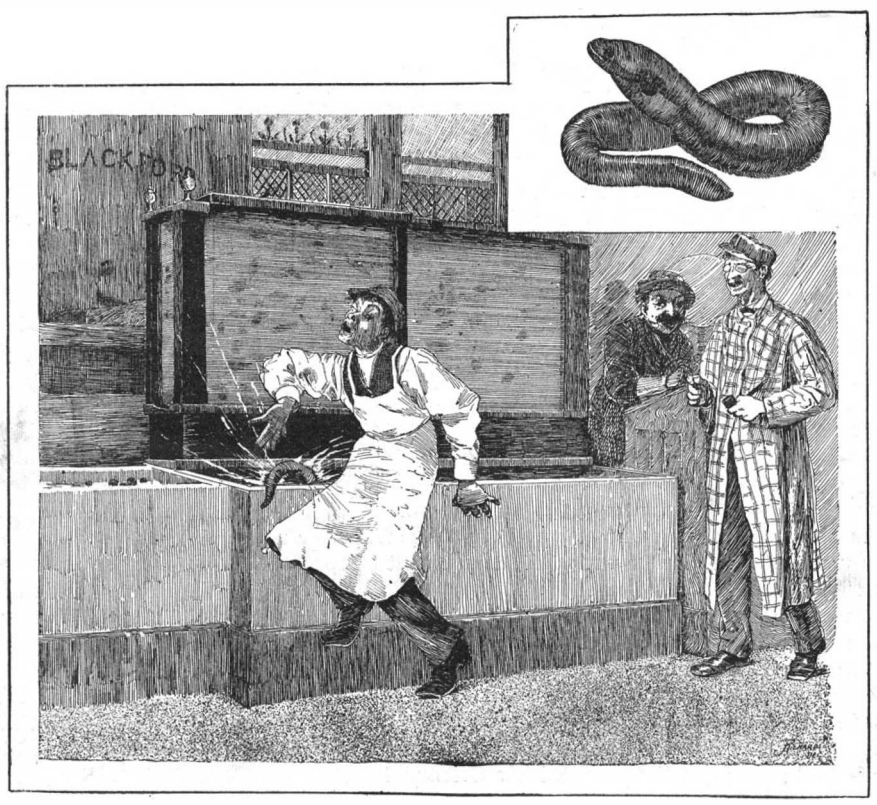
He repeatedly obtained the spark by placing a spark coil in the circuit, with files as circuit breakers. Subsequently a revolving steel plate, cut file fashion on its face, with a wire to bear on the roughened surface, was used. Connecting one piece to one saddle collector, and the other to the second one, applying them to the fish's body, and exciting it while moving one electrode over the rough surface of the other, a spark was repeatedly obtained. His object in this experiment was to secure a break in the current while it was passing.

By a rough comparison with Leyden jars, he concluded that a single medium discharge was equal to the electricity of fifteen Leyden jars with 3,500 square inches of glass, coated on both sides, and charged to its highest degree.

His general theory of the action of the fish is that a current is discharged from the head to the tail through the water as conductor. If any sensitive object, as the human hand, is placed in an intermediate part of the water, it will receive a slight shock. If the hand grasps the fish, it will also be a portion of the connecting conductor, and will be shocked up to the point of immersion. If both hands grasp it, the shock is received in great intensity, as the body all comes into the circuit. The farther apart the points of the body thus grasped were, the worse was the shock.

By bending into an arc, the fish can send a current across the chord with much force. Faraday saw it stun a fish in this manner before devouring it, coiling in a partial circle around its victim before discharging its battery. A curious feature in its disposition to discharge itself was that it would only do so repeatedly when touched by a sensitive object. Disturbed by a glass rod, it would give a few shocks, and desist; but on touching it with the hand, it would again discharge itself. This Faraday attributes to the recognition obtained by the fish from the convulsive movements of the hand of a sensitive organism. When this movement was not perceived, the fish soon desisted from shocking.

When Mr. Blackford's eel was in full vigor, many persons were shocked by merely putting their hands in the water. It was also remarked that the shock from contact with a single hand was not necessarily confined to the immersed portion.



PRACTICAL TEST OF GYMNOTUS.

Ant-Inhabited Plants.

Hernandez, about the middle of the seventeenth century, described the stipular thorns of *Acacia cornigera* of Central America, into which certain ants eat, feed upon the pulpy interior, and live in the dwelling

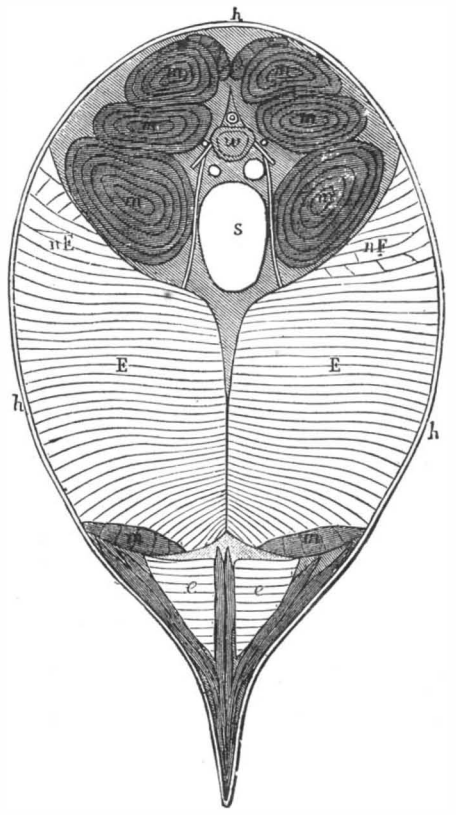


Fig. 3.—SECTION OF BODY OF GYMNOTUS.

thus made. Such inhabited thorns grow larger and distorted, and the ants seem to pay for this hospitality by protecting the tree from other marauding insects. Two woody *Rubiaceæ* of Sumatra were described in 1750 by Rumphius as inhabited by ants. They are both epiphytic and attached to the host

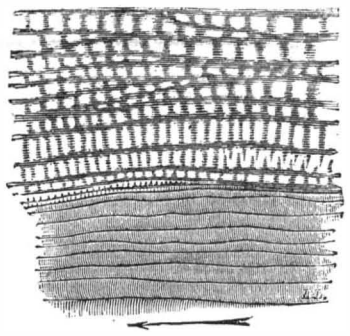


Fig. 4.—MICROSCOPIC VIEW OF CELLS OF ORGAN.

tree by a large tuberous base, which is cavernous and occupied by ants. The ants, by their irritating presence, cause the tuberous growth to enlarge, but the enlargement begins during germination, before the ants attack it—an instance of a plant preparing beforehand for expected guests. It is said that seedling plants which fail to become inhabited perish. Dr. Gray, in a review, says that "it is most supposable that this extraordinary formation was acquired gradually; that the normally fleshy caulicle of the ancestral plant, made a nidus for an insect, developed under the disturbing stimulus somewhat as a gall develops, until at length the tendency became hereditary, and the singular adaptation of plant to insect was established."—*Botan. Gazette.*

IN the SCIENTIFIC AMERICAN, not long ago, was published the record of Baldwin locomotive No. 165, which made 119,360 miles without undergoing general repairs. Locomotive No. 61, on the Northern and Northwestern R. R., Canada, and built at the Brooks Locomotive Works, at Dunkirk, N. Y., has made the wonderful aggregate mileage of 190,554 without general repairs, not even by changing a pin, brass, or driving brass, or having a flue taken out. After running 45,179 miles, with a view to changing her from a freight to a passenger locomotive, she was taken off her wheels and had her tires turned. After that she was run 145,375 miles without being lifted from her wheels. Her engineer is Robert Pearson, who has been on the road for over thirty years. No. 61 has cylinders 17 × 24 and 5 ft. drivers.

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Blast Furnaces in the United States.

The number of anthracite furnaces in blast in the United States at the commencement of October, 1886, was 114, their aggregate productive capacity being 35,819 tons per week. The corresponding number of anthracite furnaces in blast at the commencement of July, 1886, was 117, their aggregate productive capacity being 36,762 tons per week. The number of bituminous or coke furnaces in blast in the United States at the commencement of October, 1886, was 136, their aggregate productive capacity being 70,802 tons per week. The corresponding number of furnaces in blast at the commencement of July, 1886, was 132, their aggregate productive capacity being 71,316 tons per week. The number of charcoal furnaces in blast at the commencement of October, 1886, was 68, their aggregate productive capacity being 10,232 tons per week. The corresponding number of charcoal furnaces in blast at the commencement of July, 1886, was 61, their aggregate productive capacity being 9,885 tons per week. It follows that the number of furnaces of all descriptions in blast at the commencement of October, 1886, was 318, their aggregate productive capacity being 116,853 tons per week. The corresponding aggregate number of furnaces in blast at the commencement of July, 1886, was 310, their aggregate productive capacity being 117,963 tons per week.

CENTRIFUGAL TOP.

BY GEO. M. HOPKINS.

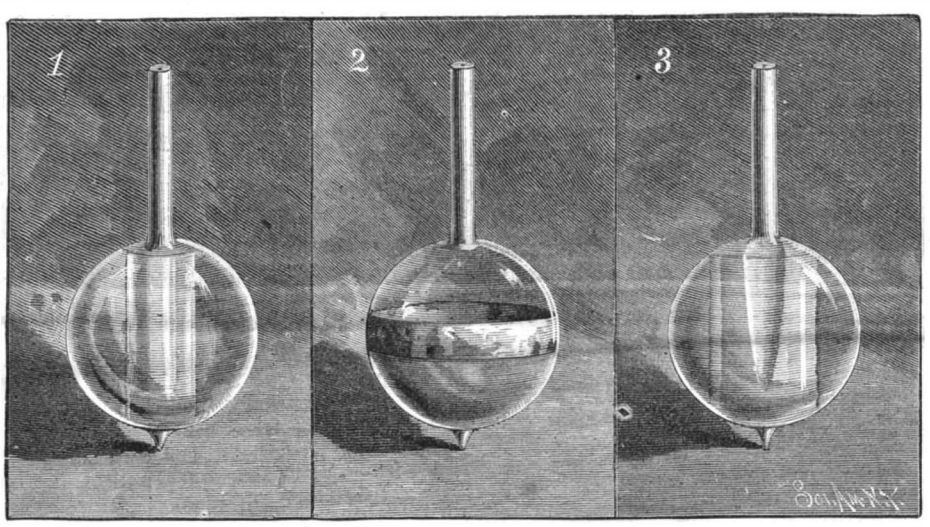
The annexed engraving shows a very simple but effective device for exhibiting centrifugal action on liquids. It is a hollow glass top of spherical form, having a tubular stem and a point on which to spin.

These tops are filled with various liquids, some of them containing two or more. The one shown in Fig. 1 is filled partly with water and partly with air. When the top is spun, the water flies as far from the center as possible, leaving in the center of the sphere an air space, which at first is almost perfectly cylindrical, but which gradually assumes the form of a parabola as the velocity of the top diminishes.

In Fig. 2 is shown a top having a filling consisting of air, water, and a small quantity of mercury. The water acts as above described, and the mercury forms a bright band at the equator of the sphere.

In Fig. 3 is shown a top containing water and oil (kerosene). The water, being the heavier liquid, takes the outside position, the oil forming a hollow cylinder with a core of air.

The top, after being filled, is corked and sealed. It is spun by the hands alone or with a string and the ordinary handle. The diameter of the top is 1½ inches. It is made of considerable thickness, to give it the required weight and strength.



TOP FOR SHOWING CENTRIFUGAL ACTION ON LIQUIDS.

Modern Cameo Cutting.

The substance of which a modern cameo is made is a piece of sea shell. Every one must have noticed that, while the outside of many shells is rough and unseemly, the interior is perfectly polished, and often of a brilliant color. If the shell be broken, the way in which the two layers lie upon and pass into each other may be clearly seen. The species used by the trade will be described farther on, but we may here premise that they are chosen on account of the thickness and hardness of the layers, of the contrast of color between them, and the presence of knobs on the exterior surface, which render it possible to work in relief.

When a cameo is begun, a piece of the shell, rather larger than the ornament is intended to be, is cut out and affixed to a wooden holder by means of a substance which looks like a coarse kind of sealing wax, and seems to the touch as firm as stone, but at once yields to any high degree of heat. The inner surface of the shell is of course the lowest, and on the gray outside the master draws a rough outline of the design, and places the work in the hands of an apprentice, who reduces the knob by means of a file to the requisite height, and with the same instrument removes all the gray matter that lies outside the boundary lines, and dresses the whole of the irregular surface. In this condition a cameo looks like an irregular piece of chalk rising out of a small plate of colored glass. It is now returned to the master, who again draws the design in pencil upon it, but more carefully this time, as the places in which the dark background has to be seen through the white mass must be indicated; and from him it passes to another apprentice or workman, who has already learned the use of the *bulino* or burin. This is an instrument which is present in at least twenty forms in every workshop of importance—the coarser almost resembling a stone cutter's tool; the finer are nearly as delicate as those used by an engraver. Thus, from the beginning to the end, the work is always submitted to the master's eye, and always passes into more skillful hands, until he himself adds the finishing touches.

It has of late years become the fashion to have cameo portraits taken. This form of art is chiefly patronized by the Americans. When such a portrait is made, the whole work, except the mere filing down, is usually done by the master's own hand. The likeness may be taken from a photograph, but the cameo cutter greatly prefers a study from life. As a rule, he demands three sittings, of about a quarter of an hour each. In the first, he makes a general outline of the face; in the second, he adds dignity, loveliness, and expression; in the third, he adds or corrects details. It must be confessed that these likenesses are often striking, always clever, and generally abominable. All the resources of the master's art somehow fail to make Brother Jonathan look like a Greek hero; and as the cutter has some classical hero always in his mind, his work is apt to become an unconscious satire. We speak of Brother Jonathan, but must confess that John Bull and his wife are not free from the same vanity. The British matron considers such portraits exquisite; they are for her the criterion of all art, the *ne plus ultra* of truth and beauty, the touchstone by which to test good taste; but we cannot defer to her opinion.

The great fault of most modern cameos is an excessive fondness for detail. The more labor that is spent upon a piece, the more valuable it becomes. Besides this, the master takes a pleasure in the exercise of his skill; he is proud of showing his work through a lens and pointing out the fineness of the single lines, and the perfection of the whole execution. This exactly suits the taste of many of his best customers, and so the general purpose of a design is often hidden under a crowd of minute felicities. It is because the Neapolitan workmen are comparatively free from this fault that their work ranks so highly as it does; but even they fall into it at times, especially in their portraits, the cheapest of which are usually also the best.

The shells used by the cameo cutter are of three kinds. The most valuable, *Casis tuberosa*, is known in the trade as *Conchiglia serpentina*. When the shell is perfect, the external layer is of a spotless white, while the lower one seems at the first glance to be black. It is, in fact, of a dark gray tint, something like unpolished steel, with brown reflections. But such specimens are exceedingly rare, as much as twenty-five francs being sometimes paid for a single one. In imperfect examples, the white layer is either too thin or is spoiled by yellowish spots, while the black one is wanting in thickness and hardness. These shells are bought by the hundred at the price of from six to eight hundred francs. About a third of the number are worthless, while only single parts of many of the rest can be used, and then only for inferior articles.—*London Saturday Review.*

The American Shipping Convention at Pensacola.

A convention in the interest of American shipping assembled at Pensacola, Fla., on the 10th, 11th, and 12th of November. It was called at the instance of the committee of the Gulf Shipping League. Without attempting anything like an account of the meeting, it will be of interest to cite some of the sentiments uttered. The decay of American shipping naturally formed one of the topics. Mexico and Spanish America generally buy annually $520,000,000 worth of goods, yet of this amount but 18 per cent comes from her near neighbor, America, and of the 18 per cent but one-third is carried in American ships.

In 1885, but 20 American ships, aggregating 3,102 tons, entered the port of New Orleans from Mexico, against 38 foreign vessels, aggregating 45,526 tons. During the same year one American ship, of 1,113 tons, entered the port from Brazil, against 41 foreign vessels, of 44,092 tons. Of 330,000 sacks of coffee imported from Brazil through New Orleans, less than 30,000 came in American bottoms. In the fiscal year ending June 30, 1884, 616 steamships entered at and cleared from Rio de Janeiro, and of these but 17 carried the American flag. The convention was naturally very desirous of seeing this state of things remedied, and a series of resolutions containing the sense of the meeting were adopted. They included indorsement of the bounty bill subsidizing American ships and suggestions for the regulation of port charges.

But one of the most striking features of the meeting was its approval of the Eads ship railroad across the Isthmus. The prediction was made that if this project were carried out, the peninsula of Florida would soon be covered with a similar one. Two resolutions were adopted indorsing the Tehuantepec ship railroad, and declaring that it would take its place in history with the Mississippi jetties of the same engineer.

The indorsement by this representative body of Col. Eads' plans is of much force. The Gulf States are deeply interested in Isthmus transit, and any means looking to its improvement are closely watched by them. The representatives of no region can less afford to approve a possible failure.

Much enthusiasm was evoked by the success of the meeting, and, after a due amount of excursions and enjoyments, it adjourned to meet at Washington, D. C., January next, at the call and under the auspices of the American Shipping and Industrial League.

Hints for Lithographers.

1. When a stone has been printed and is intended to be preserved for future use, it is not enough to have it rolled up or inked in and then well gummed. In former times the drawing or engraving was inked in or rolled up with what was called a "conservation ink." This may yet very properly be done, but very few firms indeed keep now such an ink in stock, or know even of its properties. To avoid trouble, or from want of knowledge, in the absence of this especial kind of ink, the transferer or printer, when done with the stone, uses the ordinary ink for inking in or rolling up. By and by, when the stone is again needed, this ink, it is found, has become dry, and can only be removed from the stone with damage to what may be a valuable engraving or drawing.

In our experience, we have found that the easiest, quickest, and best way of preserving a stone for future wants is the use of finely powdered resin. We have found that, even after years' delay, the ink on which the resin has been used removes freely by washing out, and shows the stone to have been excellently preserved. This should never be forgotten, since resin is not only inexpensive, but is always at hand when needed.

2. When a crayon drawing, after etching and preparing by rolling up, shows white spots—which may result from saliva, gum, sweat, or other causes—the artist is usually called to redraw such places on the stone, after the places have been counter-prepared by using acetic acid, lemon juice, etc. Although correct, this method has the fault that such counter-prepared and redrawn places always appear uneven and in varying shades, darker or lighter than the original design. This defect is caused by the fact that it is always impossible to keep the counter preparation within its proper limits.

We have found that the best way is to have the stone washed clean from all gum, etc., then fan entirely dry, and redraw the special places upon the stone without any counter preparation; then put the stone in a hand press, cover the drawing with a slightly dampened sheet, and pull through the press but once; then take off the sheet, again fan the dry stone, and afterward gum over. It will then be found that the crayon will hold as well as on an unprepared stone. The reason is obvious, since the alkali from the stone so acts upon the gum preparation that the soap in the crayon can penetrate the gum layer. Lithographers who understand the chemical actions made use of in their art will readily understand this matter.—*American Lithographer.*

Sleep a Preventive of Headache.

A scientific writer says: "Sleep, if taken at the right moment, will prevent an attack of nervous headache. If the subjects of such headaches will watch the symptoms of its coming, they can notice that it begins with a feeling of weariness or heaviness. This is the time a sleep of an hour, or even two, as nature guides, will effectually prevent the headache. If not taken just then, it will be too late, for, after the attack is fairly under way, it is impossible to get sleep till far into the night, perhaps. It is so common in these days for doctors to forbid having their patients waked to take medicine if they are asleep when the hour comes round, that the people have learned the lesson pretty well, and they generally know that sleep is better for the sick than medicine. But it is not so well known that sleep is a wonderful preventive of disease—better than tonic regulators and stimulants."

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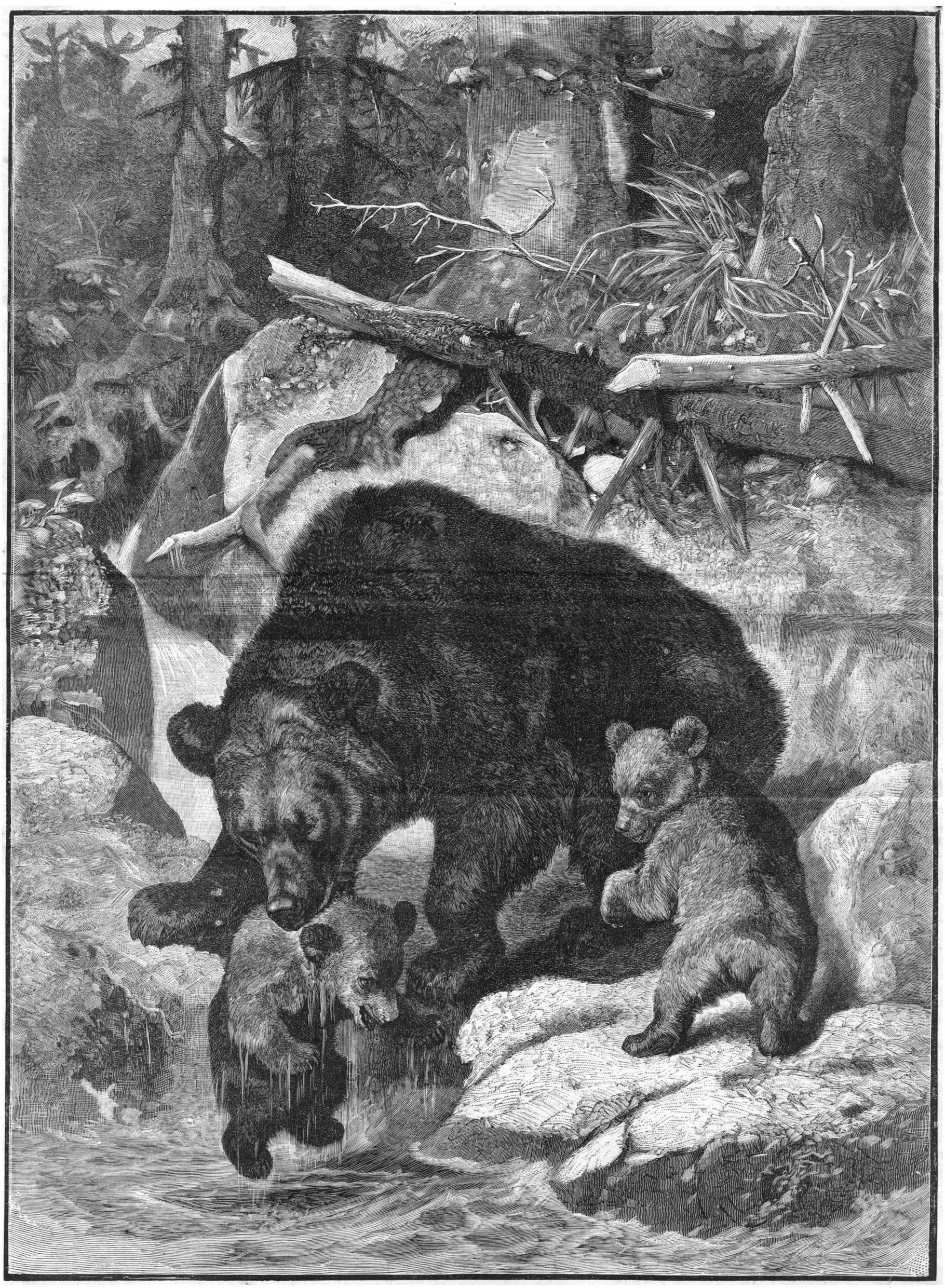
A GRIZZLY BEAR AND ITS CUBS.—"THE BATH."

In the accompanying illustration, the artist has succeeded in presenting an interesting view of the domestic amenities of bear life. The locality which the mother bear has selected for the purpose of giving her cubs an ablution is such a one as can be found in many places in California or the Rocky Mountain range, where these bears are principally to be met with, the wild and lonely neighborhood of the mountain gully, with its clear pool of cold water, furnishing a retirement in which there can be little danger of interruption.

The grizzly bear is one of the largest of the bear family, some specimens being nearly as large as the largest polar bears. Its ears are small, nose bare, hair long and abundant, particularly about the head and neck, the longest hairs being in summer about three inches and in winter five or six inches long. It varies greatly in color, so that it is difficult to find two specimens closely alike in this particular. The hair is commonly dark brown at the roots, gradually fading into reddish-brown, and is broadly tipped with white intermixed with irregular patches of black or dull brown, giving a hoary or grizzly appearance on the surface, from which it derives its name.



A GRIZZLY BEAR AND ITS CUBS.-"THE BATH."

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These bears are omnivorous, feedingly largely upon wild fruits or vegetation and honey, or upon the flesh of such beasts as are less powerful, fleet, or cunning than themselves. They ramble abroad both by day and night, and have been known to seize a wounded buffalo, kill it, and partially bury it in the earth for future use, after having gorged themselves on the best parts of the flesh and lapped up the warm blood. The number of adventures that have been related concerning the sagacity of bears when hunted or in hunting their own food would fill volumes. But in all cases their great affection for and tender care of their young, one illustration of which forms the subject of our sketch, have formed a marked feature of their character.

We are indebted to our German contemporary *Uber Land und Meer* for our illustration, which is a subject of careful study.

Natural History Notes.

A Fireproof Tree.—The *Gardeners' Chronicle* mentions a curious tree, a species of *Rhopola*, of contorted appearance, and growing to a height of about twenty feet, which is said by Mr. W. T. Thiselton Dyer to be absolutely indestructible by fire, and which survives in large districts in South America where the dry pastures and bush are burnt twice a year, and everything in the way of vegetable life is destroyed with the exception of this tree.

Forms of Cotyledonary Leaves.—At the anniversary meeting of the Linnean Society on May 20, an interesting paper was read by Sir John Lubbock on the forms of cotyledonary leaves. The result of his investigations seems to point to the conclusion that the form of the cotyledon is largely dependent on the shape and structure of the seed coat. Thus in *Chenopodium*, in which the embryo lies coiled outside the albumen, the width of the cotyledons is determined by the narrow diameter of the seed. In *Galium saccharatum*, in which a thick pericarp, rendered necessary as a protection in the hot climates in which the plant grows, leaves only a small rigid opening for the cotyledons to emerge, they are narrow, while in *Galium aparine*, in which the pericarp is thinner, and becomes split open in germination, the cotyledons are much wider. The unequal size of cotyledons, as in the sycamore, mustard, and geranium, depends upon the rolling or folding of the cotyledons one within the other, the inner one being restricted in its growth by the more rapid, because unhindered, development of the outer one. In some cases this development is carried to such an extent that only one cotyledon is formed, the inner one remaining rudimentary. The crenated appearance of some cotyledonary leaves was shown to be due, as in *Cordia*, to the plaited manner in which they are folded in the seed, but the emarginate character so well seen in the mustard, etc., seems to be due to various causes. In some, as in *Impatiens*, it is caused by the pressure of a projecting point in the testa; in mustard, by the folding of one cotyledon over another in a seed so formed as to cause an angle to be cut off; in *Senicio*, to the development of a gland arresting growth at the apex of the cotyledon. Auricled cotyledons were shown to be formed when occurring in exalbuminous seeds by the development of the cotyledon into the angle between the testa and the radicle. The non-development of cotyledons in *Gloxinia* and other plants was also alluded to. Sir John Lubbock stated his belief that the size of the seed was in direct relation to its chances of growth, and the number of seeds produced in inverse ratio to the same factor.

A Large Mullein.—La Nature has recently figured a remarkable specimen of the common mullein (*Verbascum thapsus*), which was found growing in a garden near Rouen, and the dimensions of which were as follows: Height, 10 feet 1 inch; raceme of flowers, 5½ feet in length; leaves, on an average, 1 foot wide by 2 feet in length.

The Swim Bladder of Fishes.—Charles Morris has published in the *Proceedings* of the Philadelphia Academy a theory of the origins of lungs and swim bladder, and an explanation of their homologies and the peculiarities of their relative positions. He imagines that the primitive fishes, like the sharks, were without this organ, but that some of them, venturing on land for longer or shorter excursions, took in stomach and throatfuls of air, which procured a certain aeration of the blood. He imagines that the air held in the throat finally produced a distention of its superior wall, which became later a diverticulum, and still later a sac with a narrowed opening. The tendency to rise when in the water would insure that this bag of air should maintain its position above the œsophagus. In those fishes which continued to use air, as the *Dipnoi*, the sac became cellular and more complex. Its weight would then cause it to sink below the œsophagus, as we find it in Polypterus. From this stage the lung of air breathers was derived. In those fishes which became most exclusively aquatic, the bladder underwent degeneration if it had acquired cells, and if not, remained a bladder only. In either case the loss of the connection with the œsophagus (ductus pneumaticus) is the final stage in this degeneracy.

This proposition of Mr. Morris is very plausible, and corresponds with the general course of evolution of the skeleton.—*American Naturalist.*

The Growth of Rootlets.—Messrs. Van Tieghem and Doubot have recently shown that rootlets, in making their way out from the interior of the axis of main roots, secrete a fluid which destroys the cells in their immediate neighborhood by converting them into jelly and then dissolving, perhaps absorbing, them, somewhat in the same manner that the embryo metamorphoses the albumen surrounding it and then appropriates it as food.

The Rosewood.—The leading tree that yields the rosewood of commerce has been supposed to be *Jacaranda mimosæfolia*, but it seems that the true origin of the product is not as yet definitely known. The *Proceedings* of the Botanical Society of Edinburgh gives the following as the latest information in regard to the matter:

"Brazilian rosewood, which is the rosewood *par excellence*, has been used in Europe for furniture purposes for at least 200 years, and if the dates of some articles of this material, shown at South Kensington, be correct, for nearly 300 years. Tables and cabinets were made of it long before mahogany was brought across the Atlantic. According to a Brazilian official publication, rosewood trees are abundant in all the provinces on the east side of the empire, from Pernambuco to Rio de Janeiro. The exports of this wood from Brazil have increased tenfold within the last fifty or sixty years, and now amount in value to about £100,000 per annum. Notwithstanding its importance, and the length of time it has been used in Europe, the species of tree which yields it is not yet known. In Brazil it is called jacaranda wood; but in that country there are several jacarandas—the black, the purple, the violet, the white, and the thorny jacarandas, the species of which are known, besides the rose jarcaranda, of which, apparently, only the genus is known. At all events, the botanical source of Brazilian rosewood is not known in Europe. According to the catalogue of the Kew Museum, it is supposed to be obtained from one or more species of *Dalbergia*. In East India there are three dark, heavy woods belonging to this genus, well known for their useful properties, which somewhat resemble though they have not the beauty of Brazilian rosewood. These are the *Dalbergia latifolia*, the *D. sissoo*, and the *D. cultrata*. Indeed, the *D. latifolia* has been long well known in England as East India rosewood."

Suspension of Life in Anguillalæ.—As long ago as 1735, Becker described the apparent death of dried-up *Anguillalæ*, and conceded that, at the end of a hundred or more years, these worms might, under the influence of moisture, recover their pristine activity. Needham, in 1745, demonstrated experimentally the resurrection of paste-eels after a period of twenty-eight years. More recently, Darainne has resuscitated some at the end of four years. At a recent meeting of the Academy of Sciences, the director of the Museum of Natural History of Rouen gave his opinion upon this very interesting subject. Operating upon the paste eel, he had found, he said, through experiments dating back to 1872, that at the end of fourteen years the animal's vital powers were about spent.

Brainless Fishes.—In some experiments performed some time ago by Mr. Vulpian, it was found by him that a carp, when deprived of its two cerebral hemispheres, not only survived the operation, but continued to manifest cerebral faculties; that after two or three days the fish began to eat; and that, if small fragments of hard-boiled egg were thrown to it, it went for them eagerly and devoured them. One of these fishes having been accidentally killed at the end of six months, Mr. Vulpian found, as he states in a recent note to the Academy of Sciences, that no tendency toward a reproduction of the extirpated organ was exhibited.

Correlation between the Appearance of an Animal and a Plant.—Not long ago, Mr. Von Ihering published in *Kosmos* a very interesting article upon a genuine Egyptian plague that occurs at quite irregular intervals in Brazil, viz., an invasion of mice belonging to the genus *Hesperomys*. These animals only very exceptionally visit dwellings, but live in burrows ending in a large chamber carpeted with grass. They are omnivorous, living chiefly upon seeds, herbs, and meat. Usually they are rare, and naturalists find it difficult to procure specimens of them, and this makes the prodigious numbers that appear in certain years all the more striking. In May and June, 1876, an immense number of these rodents appeared at Lourenco. The animals invaded the corn fields, and in a few days destroyed everything edible. From thence they proceeded to the potato fields, and dug up and ate or put aside everything they could find. Pumpkins and cucurbits of all kinds were opened and gutted, and the fields of oats and barley were devastated.

Then came the turn of the houses. Cats were routed, and hundreds of the mice were killed in vain, as their number was invincible. Everything except iron, glass, or stone was gnawed and destroyed. The wooden shoes of the cows were removed, fat swine devoured, and even the sleeper was not neglected by these invaders. What is interesting is the correlation existing between these invasions and the appearance of a herbaceous plant, a *Cresciuma*. This plant, which furnishes the mice with their principal food, comes to maturity and flowers only at regular intervals varying between six and thirty years.

The mice are abundant only at the epochs when this flowering occurs; after which they disappear for a time. We may see what an immense influence the proportion of food at their disposal exerts upon the number of the mice, when we reflect that, in a single summer, one couple may beget, directly or indirectly, 23,000 individuals. If, during the following years, the plant should flower and produce seed annually, as it does now only at certain intervals, the production of mice would be sufficient to drive every living being out of the country.

Movement of Plant Tendrils.—Mr. D. P. Penhallow contributes an important paper to the *American Journal of Science* upon the movement of tendrils in the squash (*Cucurbita maxima*) and pumpkin (*C. pipo*), and incidentally deals with other phenomena of growth in these plants. The results obtained are based upon observations extending over a period of ten years, the original and principal facts having been obtained in 1875 by a series of experiments which involved almost continuous observation, night and day, for a period of a week. His final conclusions with reference to the cause of motion are as follows:

1. Movements of the tendril and petiole are due to unequal growth, as producing unequal tension of tissues.

2. The unequal growth is chiefly defined in the vibrogen tissue, which may, therefore, be regarded as the seat of movement.

3. The band of unequal growth does not arise at successive points of the circumference.

4. The vibrogen tissue consists of three longitudinal bands, each of which becomes more active in turn, without regular order.

5. The collenchyme tissue is that which is chiefly concerned in variations of tension under mechanical stimuli.

6. Bending or coiling under the influence of irritation, or (free coiling) from irregularity of tension through maturity of tissues.

7. Transmission of impulses is effected through continuity of protoplasm in the active tissues.

Insects as Authors of Epidemics.—Dr. R. L. Maddox, in a paper read before the Royal Microscopical Society, details the results of further experiments in feeding insects, especially the common blow-fly, on the comma bacillus. His observations include a large number of microscopical determinations. The results of all his investigations lead him to believe that the comma bacillus from cultures can pass in a living state through the digestive tubes of some insects, and, through this fact, that such insects are likely to become an important means of distributing disease, especially to animals that feed upon them. This is in accordance with the views of Dr. Grossi, that "insects, especially flies, may be considered as veritable authors of epidemics and agents in infectious maladies."

Avoid Opiates.

The *Manufacturers' Gazette*, we believe, speaks candidly when it says that the increasing use of opiates and other drugs intended to either allay or excite nervous activity is an evil in this country equal to if not worse than the excessive use of intoxicating liquors. Comparatively little is said of it in public journals, and there is no such crusade against it as there is against intemperance. The insidiousness of the drug habit makes it the more dangerous. The great majority of those who begin the use of opium, morphine, and chloral do it under prescription of physicians, and often without being allowed to know what they are taking until the habit is thoroughly fastened upon them. Such trifling with life and health by physicians should be made a criminal offense, and its victim or his friends should prosecute for malpractice to the full extent of the law. It is a safe rule to take no medicines from any except those known to be trustworthy; and no physician is trustworthy who refuses to inform patients of possible danger from the drugs he may prescribe. So many have been wrecked in this way that the old secrecy about the composition of medicines is out of place, at least to the extent of informing patients that they are taking nothing liable to bind them in the hopeless slavery of some drug habit.

Libel as to Patent Rights.

In the case of the Baltimore Car Wheel Company *et al. vs.* Bemis *et al.*, the United States Circuit Court at Boston refused to grant an injunction restraining the defendants from making certain alleged injurious statements regarding the title of the plaintiffs to certain patents. The court said that there was no jurisdiction in a court of equity to enjoin a libel on the rights or title of the plaintiffs.

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ENGINEERING INVENTION.

A furnace has been patented by Mr. John H. Weitmyer, of Harrisburg, Pa. The fire back contains an air chamber, from which highly heated air is made to issue into the furnace in small jets, the construction being such that all the air entering the furnace becomes heated from contact with heated surfaces, and is so distributed as to cause most effective combustion and utilization of the heat.

AGRICULTURAL INVENTIONS.

A combined corn and cotton planter has been patented by Mr. William Walker, of Weimar, Texas. It is so constructed that by simply shifting the connection between the corn slide and the crank arm of an agitator, the device may be adjusted to act as a planter of corn or cotton, or, by another simple change, may be made to serve both purposes.

A planter has been patented by Mr. Richard A. Fraser, of Mansfield, La. The machine is short, narrow, and light, can easily be guided close to stumps and other obstructions, and readily handled and adjusted by any person of ordinary intelligence for planting either corn, cotton, or other seeds, in drills or hills, with regularity and without waste of the seeds.

A plow has been patented by Mr. Pinkney H. Lequire, of Greenwood, Ark. It has a curved beam, with handles attached in the usual way, and auxiliary plows connected with the beam by pivoted cross bars, and held in the position of use by slotted pivotal braces, so that it can be used as a light ordinary plow, as a right or left double shovel plow, and as a right or left side harrow or cultivator.

A cotton planter and fertilizer distributer has been patented by Mr. James W. Voltz, of Marion Junction, Ala. It has a supporting frame with hopper, independently moving distributers, and means for operating them, whereby the seed or fertilizer will be distributed with certainty and uniformity, with other novel features, making a machine simple in construction and readily adjusted and controlled.

MISCELLANEOUS INVENTIONS.

A calf weaner has been patented by Mr. Max J. Ahlgrim, of Rose Lawn, Ind. It consists of a half muzzle, formed of wire, pivoted to a halter, and connected by rods to weighted levers pivoted to the sides of the halter, arranged to lift the muzzle when the animal is in position for grazing.

A rod for banners and similar uses has been patented by Mr. Rufus H. Sawyer, of Boston, Mass. It is an ornamental bar, with a cord composed of a metallic and a fibrous strand wound around it, making an improved article for banners and bannerets, and also for lambrequins, lace curtains, etc.

A photo-developing box has been patented by Mr. William H. Lewis, of New York city. The ~~invention consists in hinging~~ the sections of the box together by yielding hinges, to avoid danger of breaking the plate, and to hold films with or without plates, and plates of different thicknesses, together with other novel features.

A packing frame for paper has been patented by Mr. Charles F. Spaulding, of Elizabeth, N. J. It is made of bars with metallic couplings and longitudinal and transverse sockets, which can be packed in small space and readily converted into a knock-down frame for bundles of paper, to prevent the binding cords from marring the edges.

A shirt has been patented by Mr. Ferdinand Jacoby, of New York city. Its body has sleeves provided with re-enforcing pieces formed with straight edges, bound in with the wrist bands, whereby it is intended that the sleeves will be more than doubled in durability, at the wrist bands and to a point above the elbow, with but slight addition to the first cost of the shirt.

A sliding door hanger has been patented by Mr. James Allan, of New York city. Combined with the door and a casing having guideways are hanging bars pivoted together at about their centers, with other novel features, whereby such doors are so supported that they can be opened and closed without coming in contact with the floor or the carpet, which can be continued through the doorway.

A button hole marker has been patented by Anna Huffer, of Cowden, Ill. It is a device of simple construction, having a scale, regularly spaced slots, a guide plate, etc., whereby button holes can be expeditiously cut or marked without raising the marker from the goods, and all be same distance from the edge of the cloth, the same distance apart, and of the same length.

A veterinary operating table has been patented by Mr. Mathew L. Faling, of Tonawanda, N. Y. Combined with a main supporting frame having racks is a table leaf with toothed quadrants engaging with the racks, and an operating mechanism, whereby the throwing or casting of a horse with a side line previous to a surgical operation may be avoided, and the horse can be handled without danger to the operator.

A cigarette machine has been patented by Mr. Ambrosio de Zayas y Moreno, of Matanzas, Cuba. The tobacco is placed in a hopper, from which it passes to a distributing and other screws, and is discharged in a packed form into the wrapper and the operation completed, the invention covering numerous novel details and combinations of parts in a machine designed to be simple and effective for producing perfect cigarettes.

A street car heater has been patented by Mr. Theodore Wiseman, of Lawrence, Kansas. The heaters consist of a cast iron arch, the ends of which are closed by rectangular front and rear castings, which serve as supports for the grate and for the ash pan, which is suspended beneath the grate, the whole being under the platforms of the car, there being a smoke outlet, distributing chamber, separate register pipes, and various other novel features.

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The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

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Notes & Queries

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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) P. H. asks: What is the best method and simplest for putting ebonized finish on small work-table? A. The stain is produced by successive applications of a decoction of logwood, followed by one of copperas; the article is then French-polished and rubbed up with oil and spirit.

(2) W. R. X. asks for a solution for waterproofing canvas horse and wagon covers that will be flexible. A. Take boiled oil fifteen pounds, beeswax one pound, ground litharge thirteen pounds; mix and apply with a brush to the article, previously stretched against a wall or a table, washing and drying each article well before applying the composition.

(3) T. L.—We do not know of any record of the first use of barrels. Their sizes were regulated by law in England over 200 years ago.

(4) H. W. L. asks the proper construction of condensers such as are used in telegraph lines. A. Use ordinary tin foil, with ordinary tissue paper between the sheets, the whole immersed in ordinary white melted paraffin, and then withdrawn. Each second sheet of tin foil is connected to one terminal, and the remaining sheets to the other.

(5) Ph. D. asks how to make gum tolu, ready for chewing. A. Take of balsam tolu 4 parts and of gum benzoin, white wax, paraffine, and powdered sugar, one part each. Melt together, mix well, and roll into sticks.

(6) J. S. McG. asks how it is that in numerous places along the Atlantic coast, a driven well, right through the salt water, will obtain pure, fresh water a few feet beneath. A. Because the Tertiary strata along the Atlantic coast from New York to Georgia slant toward and extend under the Atlantic. The subsoil water drains toward the sea, and finally issues as fresh water springs along the shore in the marshes and at the bottom of the ocean off shore. Thus artesian wells may be sunk in the sea bottom off the coast of New Jersey and fresh water obtained at the surface.

(7) F. P. L. asks: 1. Of what materials is the composition composed on picture mouldings? In what proportions are they mixed? How are they moulded in shape? How is the white grounding composition mixed and applied? A. Dissolve 1 pound of glue in 1 gallon of water. In another vessel boil together 2 pounds of resin, 1 gill Venice turpentine, and 1 pint linseed oil; mix and boil together until water has disappeared, when add finely powdered whiting until mass is of consistency of putty. This is hard when cold and soft when hot. It can be moulded in plaster of Paris or glue moulds. The white base seems to be mason's hard finish. It would be advisable to drive brads or tacks where the high parts come to be bedded in the composition, and hold it in place.

(8) J. D. asks: 1. In making the dynamo described in SUPPLEMENT, No. 161, with 12 and 14 instead of 16 and 18 wire, should it have 7 layers on the electro magnet the same? A. In general terms, it should, but we recommend exact adherence to the gauge given in our article. 2. I am making one, once and a half as high, once and a half as wide, using 9 and 11 wire; and one twice as high and twice as wide, and using 6 and 8 wire, for plating purposes. Is this the right size of wire to use? A. Your sizes of wire for the large ones will probably work, but how well we cannot say. 3. I want an apparatus for measuring currents like the one described in SCIENTIFIC AMERICAN, November 21, 1885, page 225, for the above machines. What thickness of wire would I want, and what length and width of tube, and what would be best to make the float and float rod from? A. The thickness of wire depends on the use it is to be put to. For an amperemeter it should be very heavy, for a voltmeter very fine. Make the core float of German silver or brass. 4. Would this apparatus effect the current much if constantly attached to a dynamo? A. It would not affect the current to any extent.

(9) T. H. H. asks: 1. How can I make a telegraph sounder so that the upward and downward stroke of the armature will be increased to double its present force? A. The power of stroke of a sounder is due to the size of magnet and coils and battery power. In general terms, you may increase its power by enlarging its core and armature and using larger wire, so as to secure the same number of turns in each bobbin. 2. If a single sounder will lift one pound (if attached to armature), will there be any increase in power, if the same battery is used, if another sounder was put in circuit, or would each lift only eight ounces? A. Two sounders would lift much more than one; under some conditions, nearly double with the same battery. 3. State the best practical method of collecting atmospheric electricity, aside from the lightning rod. A. For collection of atmospheric electricity, probably the rod is as good as any device. The ordinary static electric machine can hardly be said to collect electricity from the atmosphere.

TO INVENTORS.

An experience of forty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

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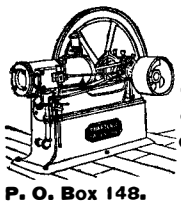

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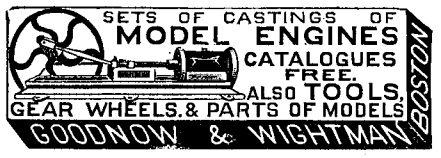

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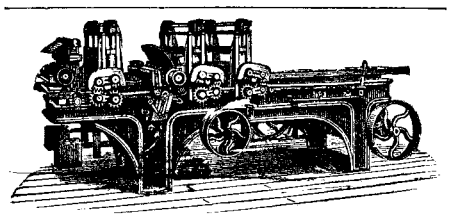

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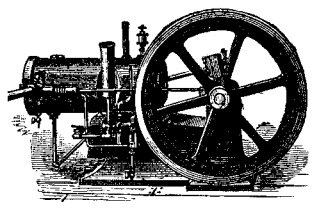

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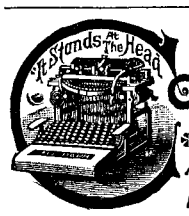

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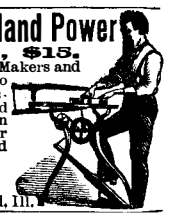

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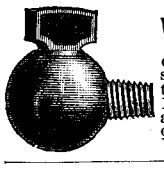

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TO THE STEEL MANUFACTURERS OF THE UNITED STATES OF AMERICA.
UNITED STATES NAVY DEPARTMENT,
WASHINGTON, D. C., Aug. 21, 1886.

The attention of all steel manufacturers of the United States is hereby invited to the requirements of the Navy Department in the way of armor-plates and heavy gun forgings, for the prosecution of work already authorized by Congress.

This advertisement invites all domestic manufacturers of steel to specify, in competition with each other, upon what terms they will engage to prepare for the production of and produce the forgings and armor-plate required for modern ordnance and armored ships: and no bids will be considered except such as engage to produce within the United States either all the gun-steel or all the armor-plate (or both) specified in this advertisement; nor will any bid be accepted unless accompanied by evidence satisfactory to the Department that the bidder is in possession of, or has made actual provision for, a plant adequate for its fulfillment.

Bids are hereby invited for supplying this Department with the under-mentioned material:

About 1,310 tons of steel gun-forgings, of which about 328 tons will be for guns of six inches caliber, 70 tons for guns of eight inches caliber, and 912 tons for calibers between ten inches and twelve inches (both inclusive).

These forgings are to be delivered rough bored and turned, and when in that state the heaviest forging which enters into the construction of a gun of each of the desired calibers will be about as follows:

6-inch	.....	3¼ tons.
8 "	.....	5 "
10 "	.....	9½ "
10½ "	.....	9¾ "
12 "	.....	12½ "

All these forgings must be delivered within the following times from the closing of a contract, viz.:

For 6 inch guns, 28 within one year, and the remainder within 18 months.

For 8 inch guns, within two years.

For 10 inch and larger guns, within 2½ years.

Preference will be given for earlier deliveries.

Also, about 4,500 tons of steel armor-plates, to be of the best material and manufacture, shaped accurately after patterns to fit the form of each vessel for which intended, and of such sizes as may be required, varying somewhat as follows:

20 feet by 8 feet by 12 inches thick.
17½ feet by 6 feet by 17 inches thick.
11½ feet by 4¼ feet by 6 inches thick.
There will also be thinner plates.

For information concerning shapes and weights of the gun forgings and armor-plates, what parts must be manufactured in sets, time of delivery of each set, the chemical, physical, and ballistic tests, which the metal must sustain in each case, and for all other particulars, apply to the Chief of Bureau of Ordance, Navy Department, Washington, D. C.

Each bid upon armor-plate must specify the time within which the bidder will engage to make delivery; and preference will be given to earliest proposed deliveries.

Proposals must be in duplicate, sealed and addressed to the Secretary of the Navy, Navy Department, Washington, D. C., the envelopes indorsed "Proposal for steel gun-forgings and armor."

They will be received at the Navy Department until 12 o'clock M. on the 10th day of December, 1886, at which hour the opening of the bids will take place.

The right is reserved to waive defects in the form of, and to reject any or all bids.

Ten per cent. of the contract price will be retained from the payment for each article delivered, until the contract, as far as relates to articles of that class, shall have been completed.

Separate bids may be submitted for the gun steel and for the armor, if any manufacturer so desires; but bids covering both will receive preference, other things being equal.

Bids will be compared in two classes.
First. Gun Forgings.
Second. Armor-plate.

And the total sum for which, and the time within which the whole of the material covered by each class will be produced and delivered will be alone considered.

WILLIAM C. WHITNEY,
Secretary of the Navy.

NOTICE.
NAVY DEPARTMENT,
WASHINGTON, *November* 6, 1886.

The time fixed by the foregoing advertisement, dated August 21, 1886, for receiving proposals for steel gun-forgings and armor-plates, viz.: December 10, 1886, is extended to 12 o'clock noon, March 15, 1887, at which hour the opening of the bids will take place.

WILLIAM C. WHITNEY,
Secretary of the Navy.

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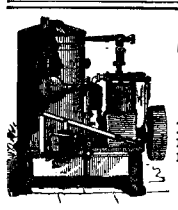

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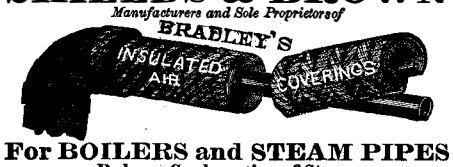

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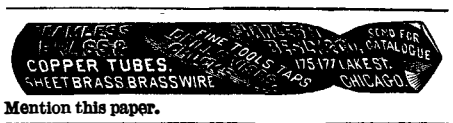

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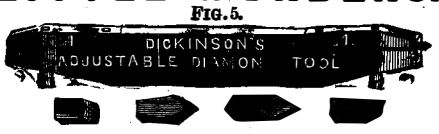

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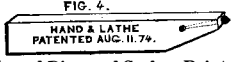
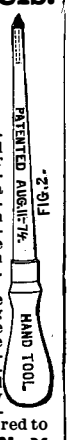
FIG. 3.

FIG. 4.





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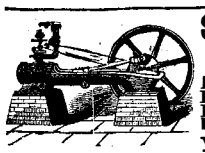

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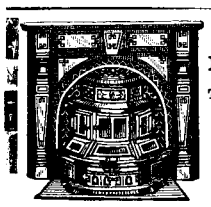

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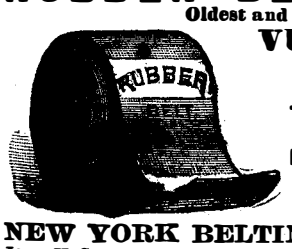

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